UPPER BARATARIA LOUISIANA RISK MANAGEMENT FEASIBILITY STUDY

DRAFT
FISH AND WILDLIFE COORDINATION ACT REPORT

U.S. FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES

LAFAYETTE, LOUISIANA

NOVEMBER 2019

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SUBMITTED TO

NEW ORLEANS DISTRICT

U.S. ARMY CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

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U.S. FISH AND WILDLIFE SERVICE

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Executive Summary

The U.S. Fish and Wildlife Service has prepared a draft Fish and Wildlife Coordination Act Report on the U.S. Army Corps of Engineers' (Corps) Upper Barataria Louisiana Risk Management Feasibility Study. The objectives of that study are to evaluate the feasibility of providing storm surge protection and protection from flooding due to heavy rainfall events for the communities located within the upper Barataria Basin of Louisiana in Lafourche, Jefferson, St. John the Baptist, St. Charles, St. James, Ascension, and Assumption Parishes. The study area encompasses an extensive complex of coastal wetland forests and marshes within the upper Barataria Basin and extends down-basin several miles below the U.S. Highway 90 crossing.

This Draft Coordination Act Report provides a preliminary analysis of fish and wildlife resource impacts associated with construction of the final array of alternative plans. Because the analysis is preliminary, this Draft Coordination Act Report does not fulfill the requirements of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). When finalized, this report would constitute the final report of the Secretary of the Interior as required by Section 2(b) of that Act. This Draft Coordination Act Report has been provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Marine Fisheries Service (NMFS). Their comments on this Draft Coordination Act Report will be incorporated into the Service's final report.

The study area forested and herbaceous wetlands are suffering from increased inundation due to the combined effects of subsidence, sea level rise, and loss of Mississippi River suspended sediment inputs. As a result, study area cypress-tupelo swamps are no longer sustainable. Bottomland hardwoods at higher elevations are converting to cypress-tupelo swamp or marsh. Upper basin marshes have remained healthy and are expected to remain relatively healthy provided that area salinities do not increase and middle and lower basin marshes remain intact.

Through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), the Corps, the Service, and other Federal and State agencies have jointly developed strategies to protect and restore Louisiana's coastal wetlands, including those within the Upper Barataria Basin. Introduction of Mississippi River suspended sediment through two small river diversion projects is proposed as the foremost strategy to help maintain the upper basin forested wetlands.

Of the two alternatives in the final array of feasible plans, the Corps has chosen the least damaging (Alternative 1). This alternative would result in direct wetland impacts to marshes, swamps, and bottomland hardwood forests of approximately 137, 1, and 42 acres, respectively. Given access difficulties and study schedule/reporting deadlines, not all impact areas could be inspected. Hence, the above referenced habitat impact estimates are tentative and need revision when time and access can be provided. Likewise, the Wetland Value Assessment (WVA) results contained herein are preliminary and subject to change when access can be provided and proper field work conducted.

Information needed to assess the magnitude of potential indirect project impacts associated with fisheries access reductions and hydroperiod increases was not available. Once that information becomes available, those indirect impact assessments can begin. Given the tentative and incomplete nature of Service-provided fish and wildlife resource impacts to date, we cannot

complete our evaluation of project effects on fish and wildlife resources, nor can we entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. If the needed information becomes available and time permits, that information and analysis will be incorporated into our Final Coordination Act Report. Additional Service involvement during the preconstruction engineering and design phase of this project, along with more-definitive project information, will be required so that we can fulfill our responsibilities under the Coordination Act. With regard to indirect project effects, the Service offers the following recommendations:

1. Additional drainage structures should be installed in the Bayou Des Allemands levee crossing should the hydrologic analysis show a with-project hydroperiod increase associated with heavy rainfall events.

2. The project drainage structures should be designed to handle inputs associated with the two Mississippi River diversions identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan without corresponding widescale hydroperiod increases.

Available information indicates that substantial direct wetland losses will result from construction of project features. Consequently, avoidance and minimization of direct wetland impacts should be pursued to the greatest extent practicable. The Service provides the following recommendations to avoid and/or minimize project impacts on fish and wildlife resources, and for mitigating unavoidable impacts to those resources.

3. The Corps should coordinate closely with the Service and other fish and wildlife conservation agencies throughout the engineering and design of project features including levees, floodgates, and environmental water control structures to ensure that those features are designed, constructed and operated consistent with wetland restoration and associated fish and wildlife resource needs.

4. Estimates of all direct and indirect project-related wetland impacts should be refined for inclusion in the project's Final Report and Environmental Impact Statement.

5. Locations of borrow for levee construction material should be identified and provided to the Service and other interested natural resource agencies.

6. To the greatest degree practical, the proposed levees and borrow pits should be located to avoid and minimize direct and indirect impacts to wetlands. Efforts should be made to further reduce those direct impacts by hauling in fill material, using sheetpile for the levee crest, deep soil mixing, or other alternatives.

7. If organic soils must be removed from the construction site, that material should be used to create or restore emergent wetlands to the greatest extent practicable. If that is not practicable, then use of that material to improve borrow pit habitat quality (e.g., construct bank slopes, reduce depths, etc.) should be examined.

8. Forest clearing associated with project features should be conducted during the fall or

winter to minimize impacts to nesting migratory birds, when practicable.

9. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of project features and timing of construction. Surveys prior to construction such be undertaken to ensure no nesting birds are within 1,000 feet of any proposed work. If nesting birds are found within 1,000 feet of any proposed work sites, the Service and the Louisiana Department of Wildlife and Fisheries should be contacted for procedures to avoid impacts.

10. The Service recommends that the Corps contact the Service for additional consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made and or finalized.

11. Full, in-kind compensation (quantified as AAHUs) should be provided for unavoidable net adverse impacts on forested wetlands, marsh, and associated submerged aquatic vegetation, including any additional losses identified during post-authorization engineering and design studies. To help ensure that the proposed mitigation features meet their goals, the Service provides the following recommendations.

    a. The Corps should fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.
    b. Levee construction borrow sites should be designed to avoid and minimize Impacts to fish and wildlife habitat; in the event new borrow sites are identified, guidelines for the selection of borrow sites are found in Appendix C.
    c. Mitigation measures should be constructed concurrently with the features that they are mitigating. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required.
    d. The Service and other fish and wildlife conservation agencies should be consulted in the development of plans and specifications for all mitigation features and any monitoring and/or adaptive management plans.
    e. To avoid shortfalls in marsh creation acreage, the contractor should be required to guarantee the creation of at least the target acreage of marsh platform, or excess acres should be created.
    f. The acreage of marsh created to mitigate project impacts should meet or exceed the marsh acreage projected by the Habitat Evaluation Team for target year 5.
    g. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.
    h. The acreage of marsh created for mitigation purposes, and adjacent affected

wetlands, should be monitored over the project life to evaluate project impacts, effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

i. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, the effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

j. The Corps should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirements.

k. The Corps should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirements. Success requirements are provided in Appendix D.

l. Dredged material borrow pits, including those utilized to create marsh for mitigation purposes, should be carefully designed and located to minimize anoxia problems and excessive disturbance to area water bottoms, and to avoid increased saltwater intrusion.

m. If applicable, a General Plan for mitigation should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands. See Appendix E for details.

Extensive additional information is needed by the Service to complete the required evaluation of project effects and fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. Much of that information may not be available until engineering and design of the project features has progressed. To help ensure that sufficient information is provided, the Service recommends that the Corps perform the following tasks during the engineering and design phase.

a. Provide additional information on anticipated construction techniques and their associated wetland impacts, such as additional dredging to install floodgates and water control structures, dredging temporary by-pass channels, construction of access roads, and the method for disposing organic surface soils that are unsuitable for levee construction.

b. Provide final levee footprint shapefiles and designs for borrow sites used in levee construction.

c. Provide with-out project channel cross-sections at or near where water control structures would be installed.

d. Provide hydrologic model outputs on FWOP and FWP stages within the protected area wetlands following a variety of heavy rainfall events.

Given that information needed to assess fish impact impacts and project-induced hydroperiod impacts are not available, the Service cannot fulfill its Coordination Act responsibilities at this time. Hence, we will require additional funding during the post-authorization engineering and

design phase of this project to fulfill our responsibilities under the Fish and Wildlife Coordination Act. Estimates of those funding needs should be coordinated in advance with the Service, and should be based on the nature and complexity of the issues.

Provided that Service funding needs are met and the above recommendations are incorporated into the feasibility report and related authorizing documents, the Service does not oppose further planning and implementation of the TSP.

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INTRODUCTION

The Upper Barataria Louisiana Risk Management Feasibility Study was authorized under the Bipartisan Budget Act of 2018, H.R. 1892 -13, Title IV, Corps of Engineers – Civil Department of the Army Investigations. The non-federal sponsor for the study is the Coastal Protection and Restoration Authority Board (CPRA) of Louisiana. That Act authorized the Corps to evaluate the feasibility of measures to reduce impacts associated with coastal storm tidal surges and headwater flooding due to rainfall within the upper Barataria Basin of Louisiana, in Lafourche, Jefferson, Ascension, St. John the Baptist, St. Charles, St. James, and Assumption Parishes.

This Coordination Act Report provides an analysis of fish and wildlife resource impacts associated with construction and the final array of alternative plans. The impact analysis utilizes the Wetland Value Assessment (WVA) methodology to assess habitat type impacts over time. When finalized, this Coordination Act Report fulfills the requirements of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and would constitute the final report of the Secretary of the Interior as required by Section 2(b) of that Act. Comments on this draft Coordination Act Report from the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Marine Fisheries Service (NMFS) will be incorporated into the Service's final report.

DESCRIPTION OF STUDY AREA

The upper Barataria Basin study area lies between Bayou Lafourche to the west, the Mississippi River to the east, and extends southward to below the U.S. Highway 90 crossing. This area is a region dominated by extensive coastal wetlands created by deltaic processes of the Mississippi River. Because of its deltaic history, the study area is characterized by a number of former distributary channels extending into the basin from either Bayou Lafourche or from the Mississippi River. Because the highest land elevations occur on the banks of those former distributary channels, developed areas are generally located there. The remainder of the upper basin consists of coastal forested wetlands, marshes and associated water bodies. The Barataria Basin exhibits a northwest-southeast salinity gradient with fresh or low-salinity conditions toward the northwest, and more saline conditions nearer the Gulf. Given that the study area is located within the upper basin, the study area is characterized by freshwater conditions, with low-salinity brackish water occurring infrequently in the more tidally influenced southern portion of the study area.

Because of the lack of mineral sediment accretion in upper basin marshes, those marshes are characterized by highly organic substrates that in many areas are floating or semi-floating. Such marshes are vulnerable to potential catastrophic degradation and loss if exposed to brackish water conditions. Additionally, such floating marshes are more susceptible to storm surge impacts than heavier mineral soil marshes.

Riverine freshwater and sediment inputs once available to the study area via Bayou Lafourche were eliminated when the bayou was damned in 1903. Seasonal freshwater and suspended sediment inputs from the Mississippi River were eliminated by construction of flood protection

levees along the Mississippi River following the catastrophic 1927 Mississippi River flood. The elimination of the riverine suspended sediment inputs has resulted in net subsidence as sediment inputs are no longer available to counteract subsidence and sea level rise. This problem, manifested in wetland loss, is most severe in the middle and lower basin (CPRA 2017) and with additional time may impact the upper basin study area as well. To address this coastal wetland loss crisis, the Davis Pond Freshwater Diversion Project was authorized and began operating in 2002. The Mid-Barataria Sediment Diversion Project, currently in engineering and design, is planned to introduce large amounts of Mississippi River water and sediments into the middle basin.

FISH AND WILDLIFE CONCERNS IN THE STUDY AREA

Construction of flood protection levees along the Mississippi River have halted annual suspended sediment inputs to upper basin swamps and marshes. With the resulting accretion deficit, the majority of those swamps are no longer capable of natural regeneration due to increasing water levels (Conner and Day 1988).

Because of sea level rise, suspended sediment deprivation and subsidence of forested wetlands within the upper basin, plans for two small-scale Mississippi River diversions or siphons were proposed in Louisiana's 2007 Comprehensive Master Plan for a Sustainable Coast (CPRA 2007). Although no longer in the current Master Plan (CPRA 2017), the subsidence-related conversion of upper basin cypress swamp to marsh or open water is only a matter of time without major efforts to restore suspended sediment inputs to the upper basin. Should upper basin swamps convert largely to open water, flood protection risks will substantially increase during tropical storm events and armoring of local protection levees may be needed to protection against wave induced erosion and failure.

Bottomland hardwood forests at slightly higher elevations are also converting to swamp, shrub-scrub, or marsh due to the increasing hydroperiod. The regional loss of coastal forested wetlands due to development and natural degradation is a concern because those forested habitats are critically important stopover habitat providing food and water resources for many species of neotropical migratory songbirds after spring migration northward across the Gulf of Mexico.

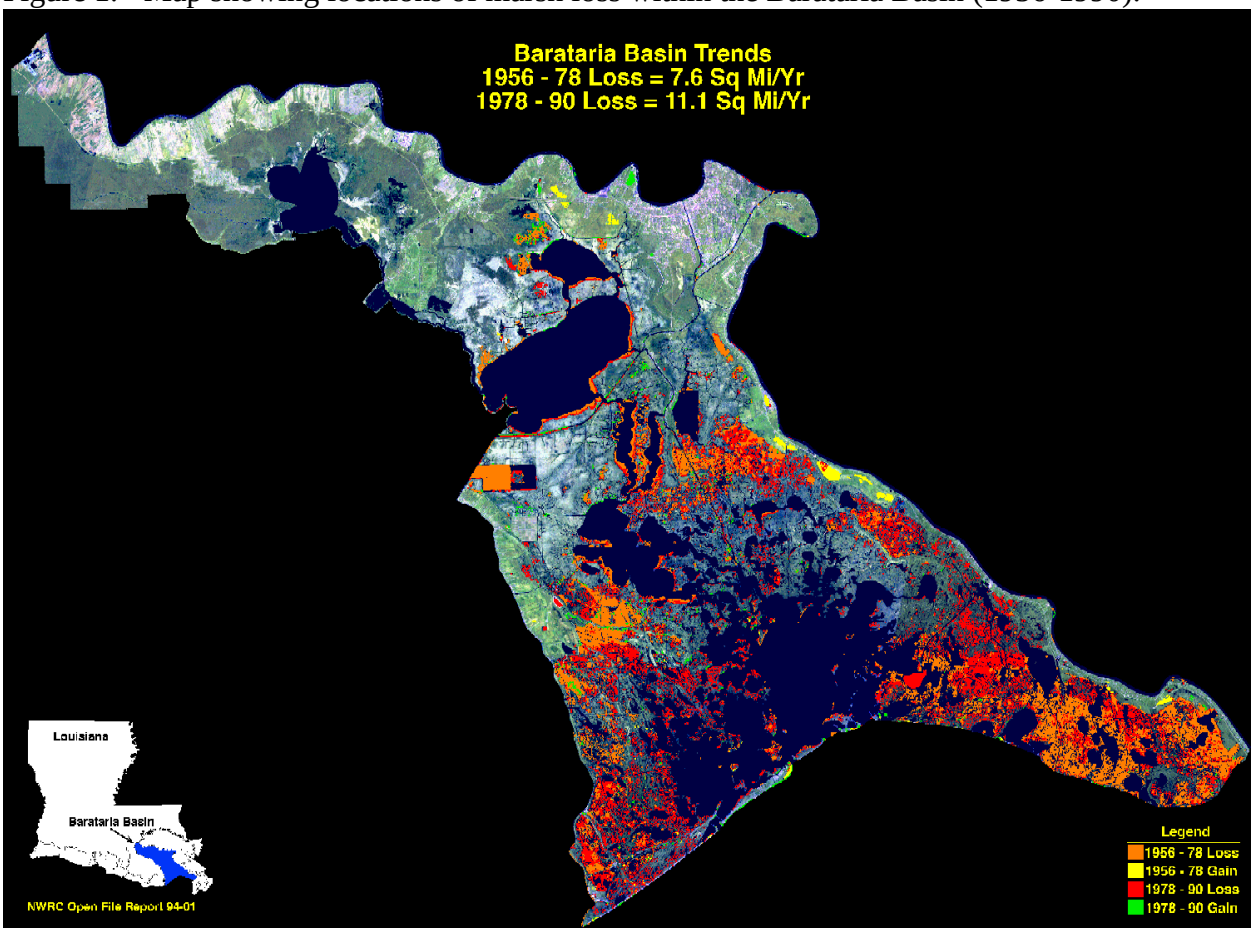
The Barataria Basin has lost over 1,120 square kilometers (276,757 acres) of marsh (1932-2016) second only to the Terrebonne Basin Basin (Table 1, from: Couvillion et al. 2017).

Table 1. Land area and change within Louisiana coastal basins 1932-2016 (square km).

Year	Atchafalaya Basin	Barataria Basin	Breton Sound Basin	Calcasieu Sabine Basin	Miss. River Basin	Mermentau Basin	Pontchartrain Basin	Teche Vermilion Basin	Terrebonne Basin
1932	550.58	3,832.61	1,107.56	2,136.71	678.75	2,481.92	2,862.43	1,421.74	4,471.55
2016	566.90	2,712.53	682.01	1,619.01	303.98	1,993.69	2,390.08	1,272.90	3,169.56
change	+16.32	-1,120.08	-425.55	-517.70	-374.77	-488.23	-472.35	-148.84	-1,301.99
%change	+3.96%	-29.22%	-38.42%	-24.23%	-55.24%	-19.67%	-16.50%	-10.47%	-29.12%

The majority of this marsh loss has occurred in the middle and lower basin (Figure 1). The fresh and low salinity marshes of the upper basin have not experienced much loss due in part to the ability of those marshes to accumulate organic matter to keep pace with subsidence and sea level rise. However, continued loss of the middle and lower basin marshes may expose the upper basin freshwater marshes and swamps to increased tidal action and salinities, resulting in accelerated losses of marshes and swamps in the project area. Continuing wetland loss constitutes a serious threat to the nationally important fish and wildlife resources of the study area.

Figure 1. Map showing locations of marsh loss within the Barataria Basin (1956-1990).



Loss of middle and lower basin marshes may also result in higher project area storm surge elevations and will increase the likelihood that open water conditions may occur on the Gulf side of proposed levees, thus increasing levee maintenance costs.

Currently the project is authorized to provide protection against tropical storm surges and heavy rainfall events. Floodgate operations to protect against tidal flooding is not an authorized project purpose. If the project sponsors wish to close floodgates to reduce tidal flooding, additional impact assessments will be needed to address associated impacts. A project alternative that would avoid this impact would be a construction of ring levee/floodwall system around communities such that the upper basin is not enclosed within a flood protection system.

If the water exchange capacity of floodgates in the cross-basin levee alternatives is insufficient to handle evacuation of heavy rainfall events, then the project may result in increased flooding of developed areas and wetlands already stressed due to the combined effects of subsidence and sea level rise. The project's storm water evacuation capacity should be designed to handle both rainfall evacuation and discharge of water diverted from the Mississippi River for wetland restoration purposes. That structure design capacity should be planned for future conditions when sea level is higher. Additionally, the proposed operation of the mid-Barataria Basin Sediment Diversion project may result in higher water elevations and may reduce the extent of low-tide events which would otherwise facilitate gravity drainage of the project area.

Section 303 (d) of Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) requires the Secretary of the Army, in consultation with the Director of the Service and the Administrator of the Environmental Protection Agency, to ensure that the project be consistent with the purposes of the restoration plan prepared in compliance with Section 303(b) of CWPPRA. In that plan, the CWPPRA Task Force identified small Mississippi River diversions into the upper Barataria Basin as the number one Regional Ecosystem Strategy for addressing loss of upper Barataria Basin swamps (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). Therefore, to be consistent with these coastal restoration plans, the desired flood protection floodgate structures must be designed to accommodate one or more small upper basin Mississippi River diversions, in addition to the capacity needed for evacuation of water following heavy rainfall events.

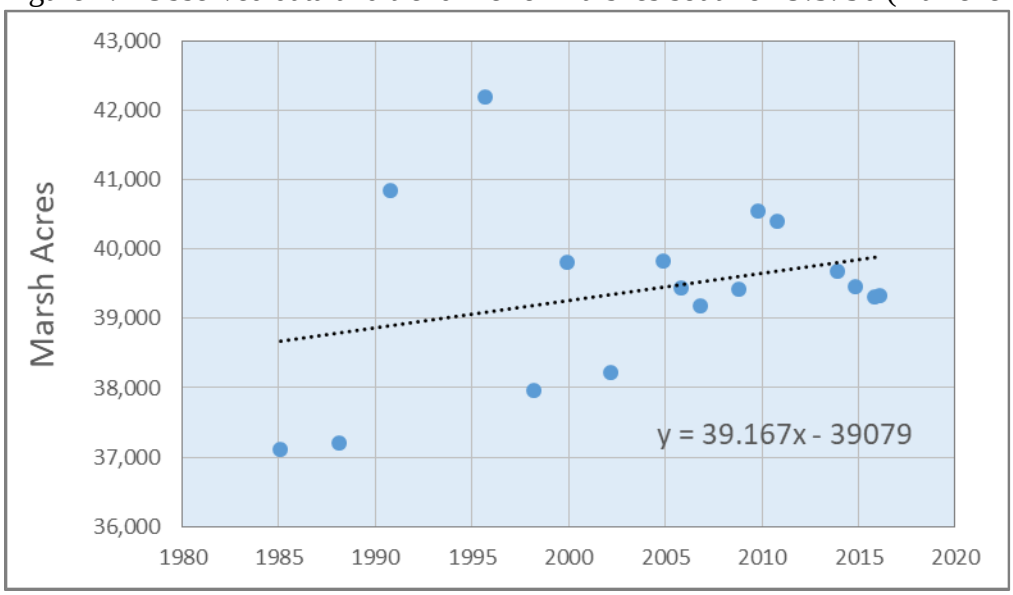
EVALUATION METHODOLOGY

Based on Corps-provided shapefiles of project alternative footprints, project impacts would occur to marshes, cypress-tupelo swamp, and bottomland hardwood forest.

Marsh - To assess construction impacts to coastal marshes, wetland acreage data (1985 through 2016) was obtained from U.S. Geological Survey (USGS) satellite imagery for each of the study area subunits. Future-without-project (FWOP) subunit marsh loss rates were determined by producing a linear trendline through the data (Figure 2) for each study area subunit. Using the trendline, marsh acreages within each study area subunit were projected from 1985 through the project life (2023 to 2073). The trendline projections are assumed to represent a continuation of the historic low sea level rise (SLR) scenario. However, future marsh acreages were also calculated for the intermediate and high SLR scenarios as explained below.

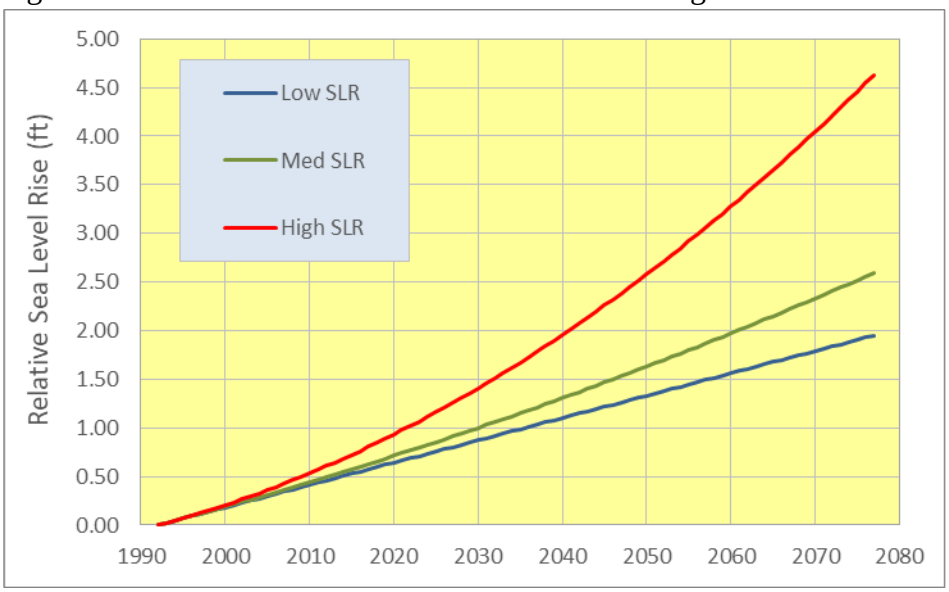
Long-term water level gage data from the Bayou Barataria at Barataria gage was utilized per the Corps' Engineering Circular (EC) 1165-2-212 to develop relative sea level rise rates associated with low (historic), intermediate, and high sea level rise scenarios. According to EC guidance,

Figure 2. Observed data and trendline for marshes south of U.S. 90 (Dufrene Pond subunit).



the intermediate and high estimates of eustatic SLR were derived using the National Research Council (NRC) equations NRC I and NRC III, respectively. Based on the Bayou Barataria gage, the historic water level rise trend has been 7.0 millimeters/year (mm/yr). Subtracting the historic eustatic SLR rate of 1.7 mm/yr yields a subsidence rate of 5.3 mm/yr. By adding the subsidence rate to the predicted eustatic SLR, RSLR rates were determined for the historic (low), medium (or intermediate) and high SLR scenarios (Figure 3).

Figure 3. Predicted RSLR estimates determined using EC 1165-2-212.



Recent wetland loss rates (1985-2016) were assumed to have occurred under a constant low or historic SLR rate. Therefore, for the low RSLR scenario (i.e., the continuation of the current 7.0

mm per year RSLR rate observed at the Bayou Barataria gage), the historic marsh loss rates were held constant and projected forward to provide yearly land acreages through the life of the project. For the intermediate and high scenarios, the 1985-2016 annual wetland loss rates for each subunit were gradually increased (beginning in 1992 per the Corps' EC 1165-2-212), by adding an additional annual increment of loss based on the SLR increase for that year. Those annual wetland loss rate increases were based on the slope of the negative relationship observed between wetland loss rates and RSLR rates from coastwide non-fresh marshes outside of active deltaic influences. In this relationship, RSLR was calculated as the sum of subsidence per statewide subsidence zones (see Figure 4) plus a eustatic SLR rate of 1.7 mm/yr. Those land loss rates in percent per year, were plotted against RSLR determined for those subsidence zones (Figure 5). According to the slope of this wetland loss versus RSLR relationship, every 1.0 mm/yr increase in RSLR would result in a 0.11%/yr increase in the wetland loss rate. The additional RSLR related wetland loss rate was then added to the baseline or historic loss rate to obtain total annual loss rates for each year, under the increasing sea level rise scenarios.

Figure 4. Coastwide subsidence zones from the Corps of Engineers.

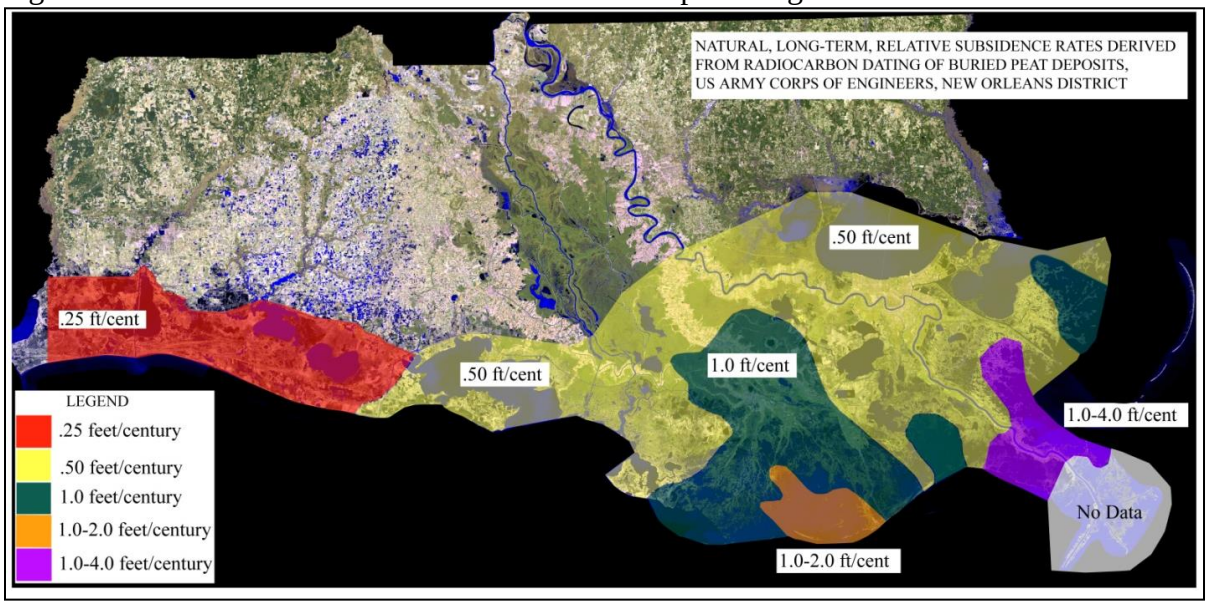
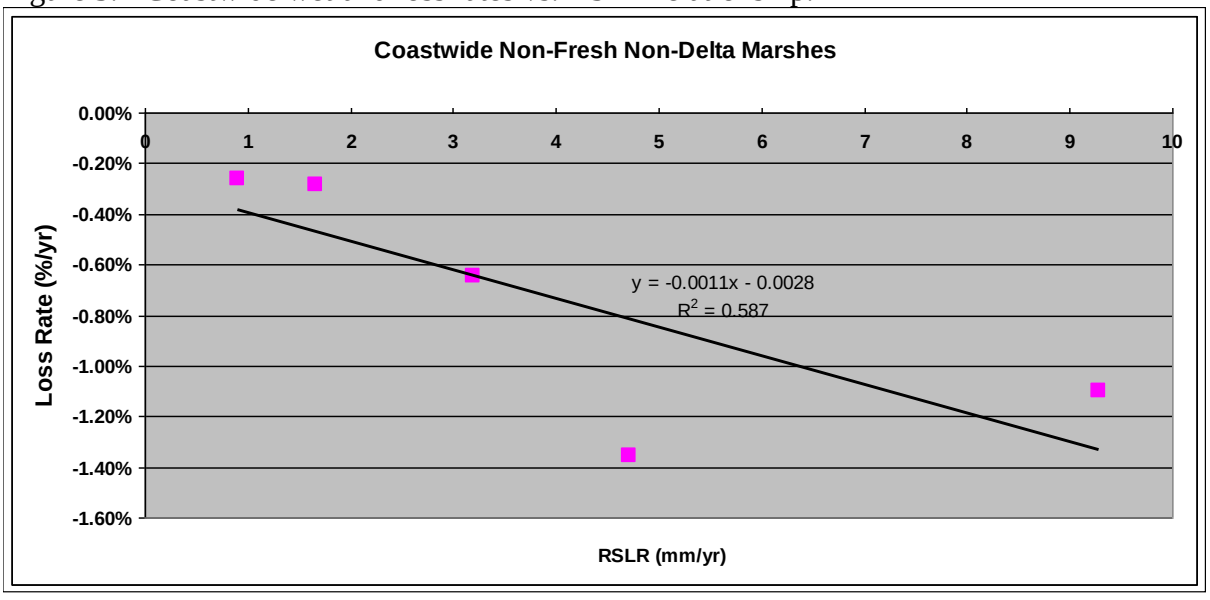


Figure 5. Coastwide wetland loss rates vs. RSLR relationship.



The USGS data indicate that under study area marshes are experiencing net wetland gains rather than losses (Figure 2). Given there are no shallow open water ponds within the impacted area, there are no shallow protected water bodies for the marsh to encroach upon (assuming marsh would not encroach into Bayou Des Allemands). Consequently, under the low SLR scenario, marsh acreage was assumed unchanged over time. However, under the two higher SLR scenarios, wetland loss begins to occur at the beginning of the project life.

To determine the acreage of habitats impacted by construction, the impact area shapefiles were overlaid on 2017 Digital Orthophoto Quarter Quads (DOQQs). Use of National Wetland Inventory Data (2008), other imagery, and field inspections conducted during October were used to subdivide the impact area shapefile into habitat types and acreage by type obtained. One temporary construction access corridor was assumed to be a permanent impact as details regarding management of the site are unknown. Additionally, it was assumed that the full construction impact would occur in the first year (first levee lift). Using wetland impact acres determined as described above, the Wetland Value Assessment (WVA v1.1) methodology was then used to assess project impacts to both habitat quantity and quality over time.

Swamp - The Corps-provided shapefiles of levee footprints were subdivided into habitat types based on site visits (October 2019). Where field observations could not be made, National Wetland Inventory data (2008) and Light Detection and Ranging (LIDAR) data were used to help distinguish swamp from BLH. Once the shapefiles were divided into habitat type, the acreage of swamp impacts were determined. Notes regarding tree canopy cover, mid-story cover, herbaceous cover, tree species, estimated tree diameter breast high (dbh), and other information were taken for a number of locations that could be accessed during the October 2019 field visits. The swamp WVA requires dbh change over time. Faster dbh and basal area growth rates were used for low SLR conditions and slower rates for higher SLR conditions. All sites were assumed to be permanently inundated. Coastal Reference Monitoring System data indicates that salinities are currently fresh for all impacted swamps. From 2017 DOQQs, estimates of forest size, and adjacent land use and disturbance were made.

Bottomland Hardwood Forest - The Corps-provided shapefiles of levee footprints were subdivided into habitat types based on site visits (October 2019). Where field observations could not be made, National Wetland Inventory data (2008) and Lidar data were used to help distinguish swamp from BLH. Once the shapefiles were divided into habitat type, the acreage of BLH impacts were determined. Notes regarding tree composition, canopy cover, mid-story cover, herbaceous cover, general health of trees, and other information were taken for a number of locations that could be accessed during the October 2019 field visits. All sites were assumed to be semi-permanently inundated. From 2017 DOQQs, estimates of forest size, and adjacent land uses and disturbance were made.

WVA Methodology

The Wetland Value Assessment (WVA) methodology was initially developed to evaluate proposed Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) projects. The WVA methodology is similar to the Service's Habitat Evaluation Procedures (HEP), in that habitat quality and quantity are measured for baseline conditions and predicted for FWOP and

FWP conditions. The Fresh/Intermediate Marsh Model was used for this project. Instead of the species-based approach of HEP, the WVA models use an assemblage of variables considered important to the suitability of a given habitat type for supporting a diversity of fish and wildlife species. As with HEP, the WVA allows a numeric comparison of each future condition and provides a combined quantitative and qualitative estimate of project-related impacts to fish and wildlife resources.

WVA models operate under the assumption that optimal conditions for fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum to provide an index of habitat quality. Habitat quality is estimated and expressed through the use of a mathematical model developed specifically for each habitat type. Each model consists of: 1) a list of variables that are considered important in characterizing fish and wildlife habitat; 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Indices) and different variable values; and 3) a mathematical formula that combines the Suitability Indices for each variable into a single value for wetland habitat quality, termed the Habitat Suitability Index (HSI).

WVA models for fresh marsh, cypress-tupelo swamp, and bottomland hardwoods were used. The habitat variable-habitat suitability relationships within those WVA models have not been verified by field experiments or validated through a rigorous scientific process. However, the variables were originally derived from HEP suitability indices taken from species models for species found in that habitat type. Habitat variable-habitat suitability relationships are, in most cases, supported by scientific literature and research findings. In other cases, best professional judgment by a team of fisheries biologists, wildlife biologists, ecologists, and university scientists may have been used to determine certain habitat variable-habitat suitability relationships. In addition, the WVA models have undergone a refinement process and habitat variable-habitat suitability relationships, HSIs, and other model aspects are periodically modified as more information becomes available regarding coastal fish and wildlife habitat suitability, coastal processes, and the efficacy of restoration projects being evaluated.

The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources.

Information on the WVA models, WVA variables, and other information/spreadsheets are available in the "WVA Model Docs" folder at following ftp site: https://www.fws.gov/gisdownloads/R4/Louisiana%20ESO/Paille/. Actual WVA files and supporting information/documents are available in the "WVAs and Supporting Docs" folder at the above referenced ftp site. More detailed information regarding WVAs conducted for this study may be obtained upon request.

Target years are established when significant changes in habitat quality or quantity were expected during the project life, under FWP and FWOP conditions. Construction of levees would begin in 2023. It is assumed that all construction impacts would occur at the beginning of that

year. WVA values quantify conditions at the end of the specified target year. WVAs for this study utilized target years (TYs) of 0, 1, and 50 for both with-project and without-project conditions.

The product of an HSI and the acreage of available habitat for a given target year is known as the Habitat Unit (HU). The HU is the basic unit for measuring project effects on fish and wildlife habitat. Future HUs change according to changes in habitat quality and/or quantity. Results are annualized over the period of analysis (i.e., 50 years) to determine the Average Annual Habitat Units (AAHUs) available for each habitat type.

The change in AAHUs for each FWP scenario, compared to FWOP project conditions, provides a measure of anticipated impacts. A net gain in AAHUs indicates that the project is beneficial to the habitat being evaluated; a net loss of AAHUs indicates that the project is damaging to that habitat type. Construction of the proposed levee segments would replace a FWOP functional marsh, swamp, or forest with a levee having no fish and wildlife habitat value. To quantify this construction related habitat loss, the WVAs' FWP acreage of marsh, swamp, and BLH was reduced to zero beginning in year 1.

Under continued low SLR, it is assumed that future salinities will remain constant given the Davis Pond Freshwater Diversion Project is authorized and operated to maintain a relatively constant salinity regime within the middle and lower basin. Under the intermediate and high SLR scenarios, it was assumed that average salinities would increase slightly. Given that the proposed mid-Barataria Sediment Diversion project has not been permitted, and since there is considerable uncertainty regarding when it might become operational, it is not considered as operating under FWOP conditions.

EXISTING FISH AND WILDLIFE RESOURCES

The study area consists of an abandoned deltaic complex. Fish and wildlife habitats include bottomland hardwood forests, cypress-tupelo swamp, shrub scrub, fresh marshes, and open water areas.

Bottomland Hardwood Forest - Bottomland hardwood forests found in coastal portions of the project area occur primarily on the natural levees of distributary channels. Dominant vegetation may include sugarberry, water oak, live oak, bitter pecan, black willow, American elm, Drummond red maple, Chinese tallow-tree, boxelder, green ash, baldcypress, and elderberry. These forests may exhibit standing water at times or seasonally, but if flooding is prolonged, less flood tolerant trees will die off and the forest will convert to cypress swamp or scrub-shrub habitats.

Cypress-tupelo swamp - These swamps are generally dominated with baldcypress, water tupelo, swamp red maple, and various understory plant species. In permanently flooded coastal swamps floating aquatic vegetation such as duckweed, Azolla, Salvinia, and water hyacinth may be common. Coastal swamp forests typically occupy the area between fresh marshes and areas of higher elevation, including the transition zones between bottomland hardwood forests on riverine

interdistributary ridges and lower elevation marshes. Healthy cypress swamps occur in fresh water areas experiencing minimal daily tidal action and where the salinity range does not normally exceed 2 parts per thousand (ppt). Salinities of 3 ppt or higher may cause significant stress and mortality of baldcypress. However, short-term exposure to such salinities may be tolerated if it does not penetrate into and persist in the soil.

Scrub-Shrub - Scrub-shrub habitat is often found along the flanks of distributary ridges. Typically it is bordered by marsh at lower elevations and by developed areas, cypress-tupelo swamp, or bottomland hardwoods at higher elevations. Typical scrub-shrub vegetation includes elderberry, wax myrtle, buttonbush, black willow, Drummond red maple, Chinese tallow-tree, and groundselbush.

Fresh Marsh - Fresh marshes occur at the upper ends of interdistributary basins and are often characterized by floating or semi-floating vegetated mats. Most fresh marshes exhibit minimal daily tidal action. Vegetation may include maidencane, bulltongue, cattail, California bulrush, pennywort, giant cutgrass, American cupscale, spikerushes, bacopa, and alligatorweed. Associated open water habitats may often support extensive beds of floating-leafed and submerged aquatic vegetation including water hyacinth, Salvinia, duckweeds, American lotus, white water lily, water lettuce, coontail, Eurasian milfoil, hydrilla, pondweeds, naiads, fanwort, wild celery, water stargrass, elodea, and others.

Developed Areas - Most developed areas are located on higher elevations of former distributary channels and are typically well drained. They include crop lands, pasture, and commercial and residential developments. In some cases, the developed areas are drained via pumping stations together with low-elevation levees.

Ponds and Lakes - Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes are deeper. In fresh and low-salinity areas, ponds and lakes may support varying amounts of submerged and/or floating-leaved aquatic vegetation. Dead-end canals and small bayous are typically shallow and their bottoms may be filled in to varying degrees with semi-fluid organic material. Along larger canals and bayous, erosion due to wave action and boat wakes, together with shading from overhanging woody vegetation, may retard the amount of marsh vegetation growing along the edges of those waterways.

Fishery Resources

Wetlands throughout the study area abound with small resident fishes and shellfishes such as least killifish, rainwater killifish, sheepshead minnow, mosquitofish, sailfin molly, grass shrimp, and others. Those species are typically found along marsh edges and among submerged aquatic vegetation, and provide forage for a variety of fish and wildlife. Fresh water and low-salinity marshes provide habitat for commercially and recreationally important resident freshwater fishes such as largemouth bass, yellow bass, black crappie, bluegill, redear sunfish, warmouth, blue catfish, channel catfish, buffalo, freshwater drum, bowfin, and gar. Water bodies having minimal water exchange and heavy cover of floating vegetation may exhibit low dissolved oxygen conditions and reduces fisheries abundance.

The project area fresh marshes also provide nursery habitat for estuarine-dependent commercial and recreational fishes and shellfishes that are tolerant of fresh water such as blue crab, white shrimp, Gulf menhaden, Atlantic croaker, red drum, southern flounder, bay anchovy, striped mullet, and others. Fresh marshes also provide habitat for largemouth bass, sunfish, warmouth, crappie, blue catfish, bowfin, and gar.

Essential Fish Habitat

The project site is located in an area that has been identified as essential fish habitat (EFH) for various life stages of federally managed species, including postlarval and juvenile life stages of brown shrimp, white shrimp, and red drum. Categories of EFH in the project area include mud and shell substrates, submerged aquatic vegetation, estuarine water column, and estuarine emergent wetlands. Detailed information on federally managed fisheries and their EFH is provided in the 2005 generic amendment of the Fishery Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council. The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (P.L. 104-297).

In addition to being designated as EFH for brown shrimp, white shrimp, and red drum, wetlands in the project area provide nursery and foraging habitats supportive of a variety of economically-important marine fishery species, including spotted seatrout, sand seatrout, southern flounder, black drum, gulf menhaden, and blue crab. Some of these species serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). These wetlands also produce nutrients and detritus, important components of the aquatic food web, which contribute to the overall productivity of the Louisiana's estuaries.

Where tidally-influenced waters designated as EFH are converted to a non-tidal elevation, loss of EFH would result. Should EFH be impacted, those losses should be quantified and presented in the Corps report. Close coordination with the NMFS is recommended because mitigation for those impacts is necessary.

Wildlife Resources

Numerous species of birds utilize study-area marshes, including migratory waterfowl which winter there. Small openings in project area cypress-tupelo swamps may also provide habitat puddle ducks like mallard and gadwall. Ducks that occur in the study area include mallard, gadwall, northern pintail, blue-winged teal, green-winged teal, American widgeon, wood duck, and northern shoveler. The resident mottled duck also utilizes project-area coastal marshes. Diving ducks prefer larger ponds, lakes, and open water areas. Common diving duck species include lesser scaup, canvasback, redhead, ring-necked duck, red-breasted merganser, and hooded merganser. Other migratory game birds found in coastal marshes include the king, Virginia, and sora rails along with the American coot, purple moorhen, common moorhen, and common snipe.

Marshes and associated shallow open water areas provide habitat for a number of wading birds, shorebirds, and other nongame birds. Common wading birds include the little blue heron, great blue heron, green-backed heron, yellow-crowned night heron, black-crowned night heron, great

egret, snowy egret, cattle egret, white-faced ibis, white ibis, and roseate spoonbill. Shorebirds include the killdeer, black-necked stilt, and common snipe. Wading bird nesting colonies may occur within in the study. Other nongame birds such as boat-tailed grackle, red-winged blackbird, northern harrier, bald eagle, belted kingfisher, and sedge wren also utilize coastal marsh areas.

Common mammals occurring in the coastal marshes include feral hogs, nutria, muskrat, mink, river otter, raccoon, swamp rabbit, white-tailed deer, and coyote.

Reptiles are most abundant in fresh marhes. Common species include the American alligator, western cottonmouth, water snakes, mud snake, speckled kingsnake, ribbon snakes, rat snakes, red-eared turtle, common snapping turtle, alligator snapping turtle, mud turtles, and softshell turtles. Amphibians commonly found in the area include the bullfrog, pig frog, bronze frog, leopard frog, cricket frogs, tree frogs, chorus frogs, three-toed amphiuma, sirens, and several species of toads.

Forested wetlands and scrub-shrub areas provide habitats for songbirds such as the mockingbird, yellow-billed cuckoo, northern parula, yellow-rumped warbler, prothonotary warbler, white-eyed vireo, Carolina chickadee, and tufted titmouse. Additionally, these areas also provide important resting and feeding areas for songbirds migrating across the Gulf of Mexico. Other avian species found in forested wetlands include the American woodcock, common flicker, brown thrasher, white-eyed vireo, belted kingfisher, pileated woodpecker, red-headed woodpecker, downy woodpecker, common grackle, and common crow. Numerous other bird species use forested wetlands throughout the study area.

Forested habitats and associated waterbodies also support raptors such as the red-tailed hawk, red-shouldered hawk, Mississippi kite, northern harrier, screech owl, great horned owl, and barred owl. Wading bird colonies typically occur in cypress swamp and scrub-shrub habitat. Species found in those nesting colonies include great egret, white ibis, black-crowned night heron, tricolored heron, little blue heron, snowy egret, white-faced ibis, and glossy ibises. Waterfowl species found in forested wetlands and adjacent waterbodies in the project area include, but are not limited to, wood duck, mallard, green-winged teal, gadwall, and hooded merganser.

Game mammals associated with forested wetlands include eastern cottontail, swamp rabbit, gray and fox squirrels, and white-tailed deer. Commercially important fur bearers include river otter, muskrat, nutria, mink, and raccoon. Other mammals found in forested wetlands include striped skunk, coyote, Virginia opossum, bobcat, armadillo, gray fox, and red bat. Smaller mammal species serve as forage for both mammalian and avian carnivores and include the cotton rat, marsh rice rat, white-footed mouse, eastern wood rat, harvest mouse, least shrew, and southern flying squirrel.

Reptiles which utilize study area bottomland hardwoods, cypress swamps, and associated shallow water include the American alligator, ground skink, five-lined skink, broad-headed skink, green anole, Gulf coast ribbon snake, yellow-bellied water snake, speckled kingsnake, southern copperhead, western cottonmouth, pygmy rattlesnake, broad-banded water snake,

diamond-backed water snake, spiny softshell turtle, red-eared turtle, southern painted turtle, Mississippi mud turtle, stinkpot, common and alligator snapping turtle, in addition to numerous other species.

Some of the amphibians believed to be in study-area forested wetlands include dwarf salamander, three-toed amphiuma, lesser western siren, central newt, Gulf coast toad, eastern narrow-mouthed toad, green treefrog, squirrel treefrog, pigfrog, bullfrog, southern leopard frog, bronze frog, upland chorus frog, southern cricket frog, and spring peeper.

Most developed areas provide low-quality wildlife habitat. Sites developed for agricultural purposes are located on low ridges and on lower elevation areas that have improved drainage. In agricultural areas, wildlife habitat is primarily provided by unmaintained ditch banks and field edges, fallow fields, pasture lands, and rainfall-flooded fields. Cultivated crops can provide forage for some wildlife species. Game species that utilize agricultural lands include the white-tailed deer, mourning dove, bobwhite quail, eastern cottontail, and common snipe. Seasonally flooded cropland and fallow fields may provide important feeding habitat for wintering waterfowl, wading birds, and other waterbirds.

Threatened and Endangered Species

Current Federally listed threatened and endangered species and their critical habitat that may be found in or near the study area include the West Indian manatee (*Trichechus manatus*) and the pallid sturgeon (*Scaphirhynchus albus*).

In accordance with Section 7(c) of the Endangered Species Act, the Corps must prepare a biological assessment to determine the effects of the recommended plan on the above-mentioned species. That biological assessment should be completed and submitted to this office prior to initiating construction or operation of proposed project features.

If the Corps determines that the proposed work may affect any listed species, the Corps must request, in writing, a formal consultation from this office pursuant to Section 7(a) of the Endangered Species Act. A request to initiate formal consultation can accompany submission of the biological assessment to the Service. In keeping with the consultation requirements of the Endangered Species Act (ESA), informal and formal (if needed) consultation must be completed before the Record of Decision for these tier-off projects can be signed.

The Service recommends that the Corps contact the Service for additional consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made and or finalized.

At-Risk species

The Service's Southeast Region has defined "at-risk species" as those that are:

1. Proposed for listing under the ESA by the Service;
2. Candidates for listing under the ESA, which means the species has a "warranted but precluded 12-month finding"; or
3. Petitioned for listing under the ESA, which means a citizen or group has requested that the Service add them to the list of protected species. Petitioned species include those for which the Service has made a substantial 90-day finding as well as those that are under review for a 90-day finding. As the Service develops proactive conservation strategies with partners for at-risk species, the states' Species of Greatest Conservation Need (defined as species with low or declining populations) will also be considered.

The Service's goal is to work with private and public entities on proactive conservation to conserve these species thereby precluding the need to federally list as many at-risk species as possible. Discussed below are species currently designated as "at-risk" that may occur within the project area. While not all species identified as at-risk will become ESA listed species, typically their reduced populations warrant their identification and attention in mitigation planning.

Eastern Black Rail

The eastern black rail (*Laterallus jamaicensis ssp.*), an at-risk species, is the smallest of North America's rail species. It has a broad distribution inhabiting higher elevations of tidal marshes and freshwater wetlands throughout the Americas. The eastern black rail breeds from New York to Florida along the Atlantic Coast and in Florida and Texas along the Gulf Coast. There is little known about the spring and fall migration as well as wintering distribution of the eastern black rail, but it has been documented to winter on the Gulf Coast from southeast Texas to Florida.

Winter habitat for the eastern black rail is presumed to be similar to breeding habitat. They are found in a variety of salt, brackish, and freshwater marsh habitats that can be tidally or non-tidally influenced. Plant structure is considered more important than plant species composition in predicting habitat suitability (Flores and Eddleman, 1995). In Louisiana, occurrences have been documented in high brackish marsh vegetated with saltgrass (*Distichlis spicata),* sea oxeye *(Borrichia frutescens)*, gulf cordgrass (*Spartina spartinae*) and saltmeadow cordgrass (*S. patens)* and often interspersed with shrubs such as marsh elder (*Iva frutescens*) or saltbush (*Baccharis hamilifolia*). The high marsh is only inundated during extreme high tide events. In general, the character of the high marsh is a short grassy savannah. It may also occur in working wetland habitats such as rice fields.

Alligator Snapping Turtle

The alligator snapping turtle (*Macrochelys temminckii*) occurs in waterways that drain into the Gulf of Mexico. Although the species range is large, population densities are likely low throughout the range. They occur in various habitats including rivers, oxbows, lakes, and backwater swamps adjacent to large rivers. It is most common in freshwater lakes and bayous, but also found in coastal marshes and sometimes in brackish waters near river mouths. Typical habitat is mud bottomed waterbodies having some aquatic vegetation. The alligator snapping turtle is slow growing and long lived. Sexual maturity is reached at 11 to 13 year of age. Because of this and its low fecundity, loss of breeding females is thought to be the primary threat to the

species. Threats include habitat alteration, exploitation by trappers, pollution, and pesticide accumulation (IUCNredlist.org).

Golden-Winged Warbler

The golden-winged warbler (*Vermivora chrysoptera*) breeds in higher elevations of the Appalachian Mountains and northeastern and north-central U.S. with a disjunct population occurring from southeastern Ontario and adjacent Quebec northwest to Minnesota and Manitoba. Wintering populations occur in Central and South America. The loss of wintering habitat in Central and South America and migratory habitat may also contribute to its decline. The golden-winged warbler is also known to hybridize with the blue-winged warbler (*Vermivora cyanoptera*).

This species may be found in forested habitats throughout Louisiana during spring and fall migrations. This imperiled songbird is dependent on forested habitats along the Gulf, including coastal Louisiana, to provide food and water resources before and after trans-Gulf and circum-Gulf migration. Population declines correlate with both loss of habitat owing to succession and reforestation and with expansion of the blue-winged warbler into the breeding range of the golden-winged warbler.

Migratory Birds and Other Trust Resources

Bald Eagle

The proposed project area may provide nesting habitat for the bald eagle (*Haliaeetus leucocephalus*), which was officially removed from the List of Endangered and Threatened Species as of August 8, 2007. However, the bald eagle remains protected under the MBTA and BGEPA. Comprehensive bald eagle survey data have not been collected by the Louisiana Department of Wildlife and Fisheries (LDWF) since 2008, and new active, inactive, or alternate nests may have been constructed within the proposed project area since that time.

Bald eagles typically nest in large trees located near coastlines, rivers, or lakes that support adequate foraging from October through mid-May. In southeastern Louisiana parishes, eagles typically nest in mature trees (e.g., baldcypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water. Major threats to this species include habitat alteration, human disturbance, and environmental contaminants. Furthermore, bald eagles are vulnerable to disturbance during courtship, nest building, egg laying, incubation, and brooding. Disturbance during these periods may lead to nest abandonment, cracked and chilled eggs, and exposure of small young to the elements. Human activity near a nest late in the nesting cycle may also cause flightless birds to jump from the nest tree, thus reducing their chance of survival.

The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. A copy of the NBEM Guidelines is available at: http://www.fws.gov/southeast/es/baldeagle/NationalBaldEagleManagementGuidelines.pdf. Those Guidelines recommend: (1) maintaining a specified distance between the activity and the nest (buffer area); (2) maintaining natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding

season. During any project construction, on-site personnel should be informed of the possible presence of nesting bald eagles in the vicinity of the project boundary, and should identify, avoid, and immediately report any such nests to this office. If a bald eagle nest occurs or is discovered within 660 feet of the proposed project area, then an evaluation must be performed to determine whether the project is likely to disturb nesting bald eagles. That evaluation may be conducted on-line at: http://www.fws.gov/southeast/es/baldeagle. Following completion of the evaluation, that website will provide a determination of whether additional consultation is necessary.

On September 11, 2009, the Service published two federal regulations establishing the authority to issue permits for non-purposeful bald eagle take (typically disturbance) and eagle nest take when recommendations of the NBEM Guidelines cannot be achieved. Permits may be issued for nest take only under the following circumstances where: 1) necessary to alleviate a safety emergency to people or eagles, 2) necessary to ensure public health and safety, 3) the nest prevents the use of a human-engineered structure, or 4) the activity or mitigation for the activity will provide a net benefit to eagles. Except in emergencies, only inactive nests may be permitted to be taken. The Division of Migratory Birds for the Southeast Region of the Service (phone: 404/679-7051, e-mail: SEmigratorybirds@fws.gov) has the lead role in conducting consultations and issuance of permits. Should you need further assistance interpreting the guidelines, avoidance measures, or performing an on-line project evaluation, please contact Ulgonda Kirkpatrick (phone: 321/972-9089, e-mail: ulgonda_kirkpatrick@fws.gov).

Coastal forest & neotropical migrating songbirds

The construction of levees and borrow canals can result in temporary and/or permanent impacts to migratory birds and the habitats upon which they depend for various life requisites. The Service has concerns regarding the direct and cumulative impacts resulting from the loss and fragmentation of forest and grassland habitats, and the direct and indirect impacts that these losses will have upon breeding migratory birds of conservation concern within the Mississippi Alluvial Valley Bird Conservation Region (http://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf). Many migratory birds of conservation concern require large blocks of contiguous habitat to successfully reproduce and survive.

In Louisiana, the primary nesting period for forest-breeding migratory birds occurs between April 15 and August 1. Some species or individuals may begin nesting prior to April 15 or complete their nesting cycle after August 1, but the vast majority nest during this period. The proposed project may directly impact migratory birds of conservation concern because habitat clearing that occurs during the aforementioned primary nesting period may result in unintentional take of active nests (i.e., eggs and young) in spite of all reasonable efforts to avoid such take. The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the MBTA has no provision for allowing incidental take, the Service recognizes that some birds may be taken during project construction/operation even if all reasonable measures to avoid take are implemented.

In addition to the direct loss of grassland and forested habitat, the proposed project may indirectly impact migratory birds of conservation concern because construction of large-scale

projects within forested habitats typically results in habitat fragmentation. Forest fragmentation may contribute to population declines in some avian species because fragmentation reduces avian reproductive success (Robinson et al. 1995). Fragmentation can alter the species composition in a given community because biophysical conditions near the forest edge can significantly differ from those found in the center or core of the forest. As a result, edge species could recruit to the fragmented area and species that occupy interior habitats could be displaced. The fragmentation of intact forests could have long-term adverse impacts on some forest interior bird species.

The primary impact to forest habitat conditions from the proposed project would result from the conversion of forest habitat to levees and open water borrow sites. We recommend that the Corps avoid impacts to forested areas (particularly those containing a hardwood species component) to the maximum extent practicable.

Colonial Nesting Birds

In accordance with the Migratory Bird Treaty Act of 1918 (as amended) and Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), please be advised that the project area includes habitats which are commonly inhabited by colonial nesting waterbirds and/or seabirds.

Colonies may be present that are not currently listed in the database maintained by the Louisiana Department of Wildlife and Fisheries. That database is updated primarily by (1) monitoring previously known colony sites and (2) augmenting point-to-point surveys with flyovers of adjacent suitable habitat. Although several comprehensive coast-wide surveys have been recently conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work site for the presence of undocumented nesting colonies during the nesting season because some waterbird colonies may change locations year-to-year. To minimize disturbance to colonial nesting birds, the following restriction on activity should be observed:

> For colonies containing nesting wading birds (i.e., herons, egrets, night-herons, ibis, and roseate spoonbills), anhingas, and/or cormorants, all activity occurring within 1,000 feet of a rookery should be restricted to the non-nesting period (i.e., September 1 through February 15, exact dates may vary within this window depending on species present).

In addition, we recommend that on-site contract personnel be informed of the need to identify colonial nesting birds and their nests, and should avoid affecting them during the breeding season. Should on-site contractors and inspectors observe potential nesting activity, coordination with the LDWF and the Service should occur.

Refuges and Wildlife Management Areas

Within the study area, the Lake Boeuf Wildlife Management Area is located in marshes south of Lake Boeuf. This area would be enclosed by cross-basin levee alternatives. There are no National Wildlife Refuges within the study area or in areas likely to be affected by construction and operation of the proposed project.

FUTURE WITHOUT-PROJECT FISH AND WILDLIFE RESOURCES

Study-area fresh marshes will likely remain relatively healthy provided salinities do not increase and provided that SLR remains relatively low. Increases in salinity or rapid SLR will likely result in gradually increasing marsh loss. Continued operation of the Davis Pond Freshwater Diversion should help to preclude detrimental salinity increases. However, under the higher SLR scenarios, continued loss of middle and lower basin marshes would allow tidal exchange to increase project area salinities despite Davis Pond Diversion freshwater inputs.

Fish and wildlife resources that use area marshes may initially benefit from increased marsh loss as degradation would convert project area marshes having no internal open water to a complex having more interspersed internal water areas. With continued marsh loss, fish and wildlife habitat quantity and quality will decrease, thereby reducing fish and wildlife abundance. As lower basin marshes continue to degrade, estuarine-dependent fisheries will increasingly seek to utilize upper basin marshes and degrading forested wetlands. This would partially offset the loss of nursery habitat in the middle and lower basin and extend the period of high Barataria Basin estuarine fisheries production. But eventually should upper basin wetlands degrade sufficiently, fisheries production will decrease substantially.

Because of semi-permanent or permanent inundation, a majority of the upper basin cypress-tupelo forests are unsustainable and will gradually thin out and convert to marsh or open water. If rapid salinity increases occur, the mortality of cypress will be accelerated and impacted swamps would be more likely convert to open water rather than marsh. The bottomland hardwoods, already suffering from excessive inundation, will convert to degraded swamp, scrub-shrub, or marsh. Migratory songbirds which use these coastal forests as important stop-over habitat when migrating northward across the Gulf, will have to fly further north to encounter suitable stop-over habitat. Resident forest-dependent wildlife will be gradually displaced to adjoining developed areas and there suffer from loss of food resources and increased mortality.

DESCRIPTION OF ALTERNATIVE PLANS

The final array of alternatives consists of two levee construction alternatives.

Alternative 1: This, alternative raises existing forced drainage levees extending from Paradis to the community of Des Allemands and then a new levee segment would cross the basin from Bayou Des Allemands parallel to and south of Highway 90, terminating near Raceland on Bayou Lafourche (Figure 6). The levee would be constructed to an elevation of 7.5 feet and would be 18.3 miles in length. A 270-foot-wide barge gate would be installed in Bayou Des Allemands to provide gravity drainage. Borrow would come from nearby farmlands. Alternative 1 has been chosen as the Tentatively Selected Plan (TSP)

Alternative 2: This alignment incorporates all of Alternative 1 footprint plus it includes raising the existing St. Charles Parish protection levee northeastward to the Mississippi River at Luling (Figure 7). The levee would be constructed to an elevation of 8.5 feet and would be 30.4 miles

long. A 270-foot-wide barge gate would provide gravity drainage at Bayou Des Allemands. Borrow for levee construction would come from nearby farmlands.

Figure 6. Map illustrating the proposed Alternative 1 levee alignment.

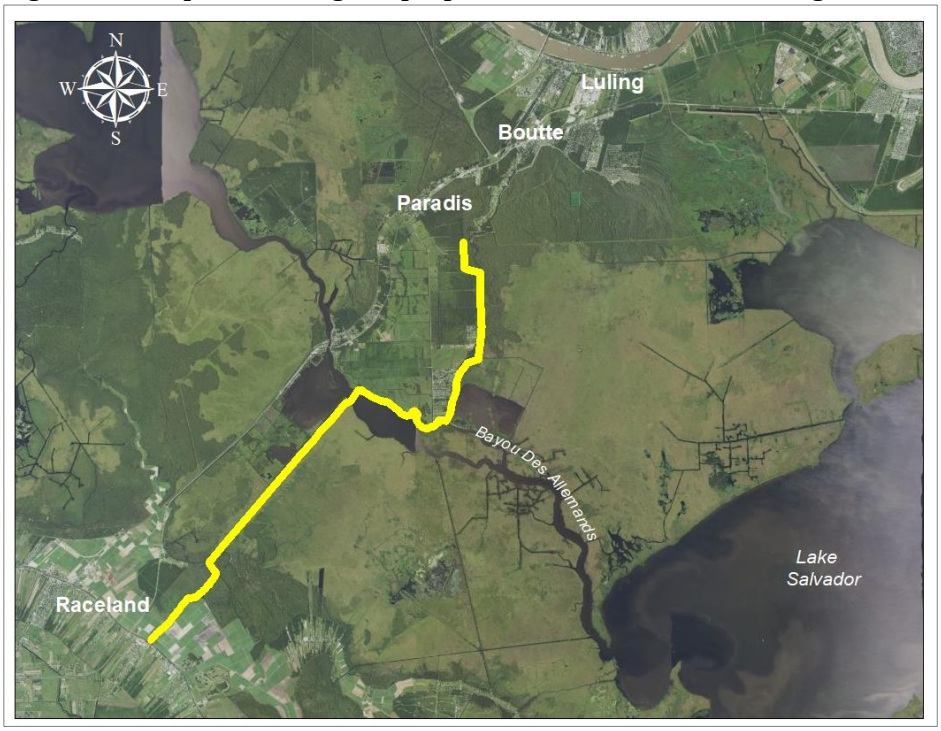


Figure 7. Map illustrating the proposed Alternative 2 levee alignment.

EVALUATION OF ALTERNATIVE PLANS

Fish and wildlife resource impacts were determined for the final array of alternatives described above. The Corps has determined that Alternative 1 is the Tentatively Selected Plan (TSP). Acreage of direct wetland construction impacts by habitat type were obtained from 2017 DOQQs and habitat types determined from that imagery in combination with field inspections conducted during October 2019 (Table 2). Given schedule constraints and lack of access to some future impact sites, the habitat type determination in areas is tentative. The direct impacts provided below include impacts associated with two construction access roads. The TSP is the least damaging of the alternatives in the final array of alternatives.

Table 2. Direct impacts by habitat type and levee alternative.

Habitat Type	Alt 1 (acres)	Alt 2 (acres)
Bottomland Hardwood Forest	41.68	86.66
Cypress-Tupelo Swamp	1.04	36.43
Fresh Marsh	136.54	148.93

Bottomland hardwood forest (BLH) impacts would occur within the forced drainage area of the Sunset Drainage District. A small acreage of the Paradis Mitigation Bank located within that forced drainage district would be impacted. An acre of cypress swamp within the Sunset District would also be impacted. Wetlands within the Sunset Drainage District are not exposed to increasing SLR effects as are the remaining impact areas.

Near the Raceland end of the proposed levee, impacted BLH consists of inundation stressed and stunted red maple. Along portions of the St. Charles levee, BLH is also stressed, but impacts to more healthy BLH stands would also occur. Due to its low quality, the inundation stressed BLH could be classified as a Resource Category 3 rather than Category 2. A more thorough field inspection would be needed to consider this change.

More acres of fresh marsh are directly impacted by both alternatives than any other habitat type. Those impacts are greatest immediately southwest of Bayou Des Allemands where a new levee would be constructed across marsh. Lesser fresh marsh impact acreage is located adjacent to the St. Charles levee where inundation has converted former BLH to marsh. A more detailed breakdown of direct impacts by location is provided in Appendix A. Direct impacts in AAHUs are provided in Table 3 with a more detailed breakdown provided in Appendix B.

Because Alternative 1 has the narrowest footprint and is a shorter levee alignment, impacts for this alternative are less than those of alternative 2. Temporal impacts to BLH forest (for both alternatives) could be reduced if the northern construction access route were replanted after construction. It is assumed that borrow for levee construction will come from existing agricultural areas. If borrow is taken from forested or wetland areas, additional borrow-related impacts would need to be quantified.

Table 3. Direct impacts in AAHUs by habitat type, alternative, and SLR scenario.

Habitat Type	Alt 1 Low SLR (AAHUs)	Alt 1 Int SLR (AAHUs)	Alt 1 High SLR (AAHUs)
Bottomland Hardwood Forest	-16.05	-15.83	-14.80
Cypress-Tupelo Swamp	-0.56	-0.56	-0.56
Fresh Marsh	-63.92	-69.62	-56.35

Habitat Type	Alt 2 Low SLR (AAHUs)	Alt 2 Int SLR (AAHUs)	Alt 2 High SLR (AAHUs)
Bottomland Hardwood Forest	-25.83	-24.77	-21.28
Cypress-Tupelo Swamp	-21.57	-21.57	-19.84
Fresh Marsh	-69.72	-75.94	-61.45

Indirect Impacts

Installation of the 270-foot-wide barge gate in Bayou Des Allemands has the potential to reduce water exchange and increase the hydroperiod of the upper Barataria Basin. Upper Barataria Basin forested wetlands are already near or at a permanently inundated condition. Consequently, growth rates of trees in those areas could be further reduced and tree mortality increased should the project cause stage increases of sufficiently long durations. Information needed to assess this possible impact is not available at this time. Hence, this impact assessment is incomplete in regard to this potentially large-scale indirect impact.

Fish Access Impacts

The proposed stoplog water control structure on the Godchaux Canal would reduce the canal width from 125 feet to 15 feet (82% reduction when structure open). Consequently, this structure may reduce fishery access to fresh marsh areas southwest of that structure. The Bayou Des Allemands floodgate may also reduce water exchange and fisheries access. Additional channel cross-section information is needed to assess this possible impact.

FISH AND WILDLIFE CONSERVATION MEASURES

The President's Council on Environmental Quality defined the term "mitigation" in the National Environmental Policy Act regulations to include the following elements as the desirable sequence of steps in the mitigation planning process:

a) avoiding the impact altogether by not taking a certain action or parts of an action;

b) minimizing impacts by limiting the degree or magnitude of the action and its implementation;

c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment;

d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and

e) compensation for the impact by replacing or providing substitute resources or environments.

The Service's mitigation policy (Federal Register, Volume 46, Number 15, pages 7656-7663, January 23, 1991) provides guidance to help ensure that the level of mitigation recommended by the Service is consistent with the value and scarcity of the fish and wildlife resources involved. In keeping with that policy, the Service usually recommends that losses of high-value habitats which are becoming scarce be avoided or minimized to the greatest extent possible. Unavoidable losses of such habitats should be fully compensated by replacement of the same kind of habitat value; this is called "in-kind" mitigation.

Coastal marshes are considered by the Service to be aquatic resources of national importance due to their increasing scarcity and high habitat value for fish and wildlife within Federal trusteeship (i.e., migratory waterfowl, wading birds, other migratory birds, threatened and endangered species, and interjurisdictional fisheries). Likewise, forested wetlands (swamp and BLH) and dry forest are nationally significant resources having high fish and wildlife value that are becoming increasingly scarce, especially in coastal Louisiana. Therefore, the Service recommends that unavoidable losses of those habitats be compensated in-kind. Highly degraded/dying BLH may be considered as a Resource Category 3 and could be mitigated out-of-kind (i.e., other forest types).

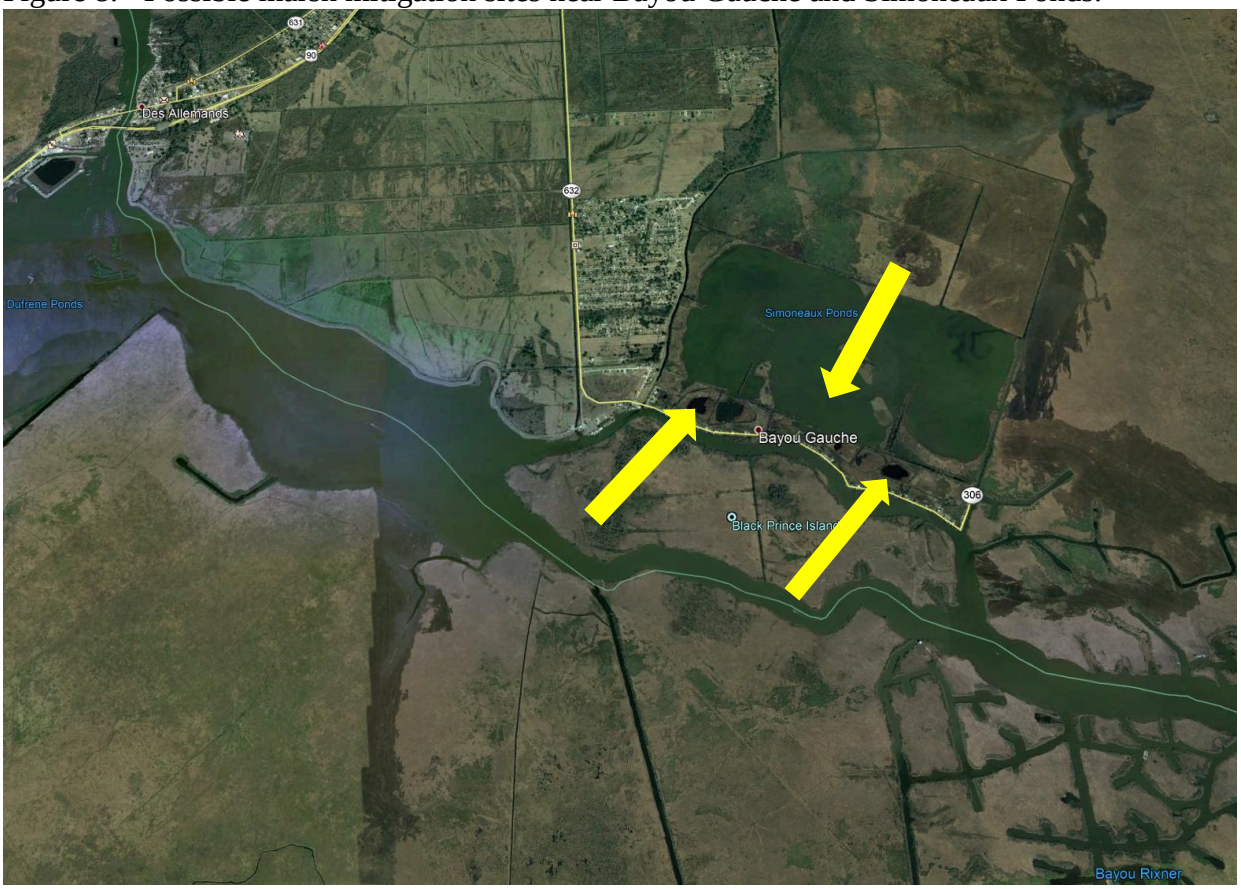
The impacts to swamp and BLH might be mitigated through use of nearby mitigation banks. Fresh marsh impacts associated with the TSP are rather large. Mitigation for those impacts might be achieved by creating marsh near the project site in the open areas north of the Bayou Gauche road (Highway 306) or in the Simoneaux Ponds area (Figure 8). If the mitigation site borders large open water areas, containment dikes might need to be armored to preclude erosional losses of the dikes and marshes therein. The deadlines for completion of this Coordination Act Report did not allow for a mitigation analysis of these areas.

Marsh creation mitigation projects should be monitored to ensure that the desired mitigation is achieved at a point 5 years after project implementation, and at 10 year intervals thereafter. Successful marsh creation will depend on achieving a settled disposal area elevation conducive to marsh vegetation establishment.

Because past experience shows that shortfalls in created marsh acreage often occur, especially when borrow for containment dike construction is taken from within the mitigation area. The Service recommends that the target marsh acreage should be set above the required acreage, or that the contractor must guarantee that the required acreage will be established. The Service also recommends that the Corps monitor the acreage of created marsh, and other affected wetlands in the project area, throughout the project life to help assess project impacts and ensure that full

compensatory mitigation is achieved. The resulting monitoring should be used to assess the need for additional mitigation, if monitoring reveals a mitigation shortfall.

Figure 8. Possible marsh mitigation sites near Bayou Gauche and Simoneaux Ponds.



Dredging of water bottoms for borrow material may result in the creation of deep holes. Reduced flushing in those areas may promote development of anoxic conditions due to the accumulation of organic matter and pollutants. Anoxia would be aggravated by high temperature and salinity stratification, particularly during the summer months. To avoid such problems, borrow areas should be designed to minimize the likelihood that anoxic conditions would develop.

Because of the large quantity of dredged material potentially needed to mitigate project impacts, careful consideration should be given to the borrow site design. If borrow sites are dredged to shallow depths to avoid creating anoxic sumps, then more surface area will need to be dredged to obtain the needed quantity of material. By dredging over a larger surface area, potential complications may include: 1) more benthos may be affected, which may reduce (at least temporarily) food availability for fishery organisms; 2) other sessile organisms, such as oysters, could be affected; and 3) by continually moving the cutterhead, the resuspended sediments will take longer to settle and could prolong the periods of high turbidity associated with dredging operations. The Service is also concerned that extensive borrow from linear waterways or canals may exacerbate saltwater intrusion and/or bank failure, resulting in accelerated marsh loss rates.

Borrow sites should be located and designed to avoid those possible impacts.

Because of relative sea level rise combined with long-term deprivation of Mississippi River suspended sediment inputs, the upper basin wetlands are suffering from excessive hydroperiod impacts. Indirect hydrologic effects of the proposed levee and floodgate on water levels could worsen this problem causing accelerated degradation of upper basin wetlands. Information regarding project effects on upper basin hydroperiod are not yet available.

For the proposed project to be consistent with the Coastal Wetlands Planning and Restoration Act (CWPPRA) as required by Section 303(d)(1) of that Act, the drainage capacity of the Bayou Des Allemands floodgate should be sized to handle local drainage needs plus that of the two small Mississippi River diversions identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan.

To ensure that project features do not worsen the hydroperiod and are capable of handling drainage associated with those two small CWPPRA proposed Mississippi River diversions, the Service recommends that additional drainage structures be installed in the Bayou Des Allemands levee crossing should the hydrologic analysis show a with-project hydroperiod increase associated with heavy rainfall events. Given that the Bayou Des Allemands levee crossing exceeds 1,500 feet, there should be room for the proposed 270-foot-wide floodgate, plus additional gates.

SERVICE POSITION AND RECOMMENDATIONS

Because information regarding possible fisheries access impacts associated with proposed water control structures and the project related hydrologic effects are not yet available, we cannot complete our evaluation of project effects on fish and wildlife resources, nor can we entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. If available, that information will be incorporated into our Final Coordination Act Report. Additional Service involvement during the preconstruction engineering and design phase of this project, along with more-definitive project information, will be required so that we can fulfill our responsibilities under the Coordination Act. With regard to indirect project effects, the Service recommends:

1. Additional drainage structures should be installed in the Bayou Des Allemands levee crossing should the hydrologic analysis show a with-project hydroperiod increase associated with heavy rainfall events.

2. The project drainage structures should be designed to handle inputs associated with the two Mississippi River diversions identified in the 1993 CWPPRA Louisiana Coastal Wetlands Restoration Plan without corresponding widescale hydroperiod increases.

Available information indicates that substantial direct wetland losses will result from construction of project features. Consequently, avoidance and minimization of direct wetland

impacts should be pursued to the greatest extent practicable. The Service provides the following recommendations to avoid and/or minimize project impacts on fish and wildlife resources, and for mitigating unavoidable impacts to those resources.

3. The Corps should coordinate closely with the Service and other fish and wildlife conservation agencies throughout the engineering and design of project features including levees, floodgates, and environmental water control structures to ensure that those features are designed, constructed and operated consistent with wetland restoration and associated fish and wildlife resource needs.

4. Estimates of all direct and indirect project-related wetland impacts should be refined for inclusion in the project's Final Report and Environmental Impact Statement.

5. Locations of borrow for levee construction material should be identified and provided to the Service and other interested natural resource agencies.

6. To the greatest degree practical, the proposed levees and borrow pits should be located to avoid and minimize direct and indirect impacts to emergent wetlands. Efforts should be made to further reduce those direct impacts by hauling in fill material, using sheetpile for the levee crest, deep soil mixing, or other alternatives.

7. If organic soils must be removed from the construction site, that material should be used to create or restore emergent wetlands to the greatest extent practicable. If that is not practicable, then use of that material to improve borrow pit habitat quality (e.g., construct bank slopes, reduce depths, etc.) should be examined.

8. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

9. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of project features and timing of construction. Surveys prior to construction such be undertaken to ensure no nesting birds are within 1,000 feet of any proposed work. If nesting birds are found within 1,000 feet of any proposed work sites, the Service and the Louisiana Department of Wildlife and Fisheries should be contacted for procedures to avoid impacts.

10. The Service recommends that the Corps contact the Service for additional consultation if: 1) the scope or location of the proposed project is changed significantly, 2) new information reveals that the action may affect listed species or designated critical habitat; 3) the action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. Additional consultation as a result of any of the above conditions or for changes not covered in this consultation should occur before changes are made and or finalized.

11. Full, in-kind compensation (quantified as AAHUs) should be provided for unavoidable

net adverse impacts on forested wetlands, marsh, and associated submerged aquatic vegetation, including any additional losses identified during post-authorization engineering and design studies. To help ensure that the proposed mitigation features meet their goals, the Service provides the following recommendations.

n. The Corps should fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

o. Levee construction borrow sites should be designed to avoid and minimize impacts to fish and wildlife habitat; in the event new borrow sites are identified, guidelines for the selection of borrow sites are found in Appendix C.

p. Mitigation measures should be constructed concurrently with the features that they are mitigating. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required.

q. The Service and other fish and wildlife conservation agencies should be consulted in the development of plans and specifications for all mitigation features and any monitoring and/or adaptive management plans.

r. To avoid shortfalls in marsh creation acreage, the contractor should be required to guarantee the creation of at least the target acreage of marsh platform, or excess acres should be created.

s. The acreage of marsh created to mitigate project impacts should meet or exceed the marsh acreage projected by the Habitat Evaluation Team for target year 5.

t. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

u. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

v. The acreage of marsh created for mitigation purposes, and adjacent affected wetlands, should be monitored over the project life to evaluate project impacts, the effectiveness of compensatory mitigation measures, and the need for additional mitigation should those measures prove insufficient.

w. The Corps should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirements.

x. The Corps should maintain full responsibility for all mitigation projects until the projects are found to be fully compliant with success and performance requirments. Success requirements are provided in Appendix D.

y. Dredged material borrow pits, including those utilized to create marsh for mitigation purposes, should be carefully designed and located to minimize anoxia problems and excessive disturbance to area water bottoms, and to avoid increased saltwater intrusion.

z. If applicable, a General Plan for mitigation should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section

3(b) of the FWCA for mitigation lands. See Appendix E for details.

Extensive additional information is needed by the Service to complete the required evaluation of project effects and fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act. Much of that information may not be available until engineering and design of the project features has progressed. To help ensure that sufficient information is provided, the Service recommends that the Corps perform the following tasks during the engineering and design phase.

1. Provide additional information on anticipated construction techniques and their associated wetland impacts, such as additional dredging to install floodgates and water control structures, dredging temporary by-pass channels, construction of access roads, and the method for disposing organic surface soils that are unsuitable for levee construction.

2. Provide final levee footprint shapefiles and designs for borrow sites used in levee construction.

3. Provide with-out project channel cross-sections at or near where water control structures would be installed.

4. Provide hydrologic model outputs on FWOP and FWP stages within the protected area wetlands following an variety of heavy rainfall events.

Sufficient funding should be provided for full Service participation in the post-authorization engineering and design studies, and to facilitate fulfillment of its responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act.

Given that information needed to assess fish impact impacts and project-induced hydroperiod impacts are not available, the Service cannot fulfill its Coordination Act responsibilities at this time. Hence, we will require additional funding during the post-authorization engineering and design phase of this project to fulfill our responsibilities under the Fish and Wildlife Coordination Act. Estimates of those funding needs should be coordinated in advance with the Service, and should be based on the nature and complexity of the issues.

Provided that Service funding needs are met and the above recommendations are incorporated into the feasibility report and related authorizing documents, the Service does not oppose further planning and implementation of the TSP.

LITERATURE CITED

Conner, W.H., and J. W. Day, Jr. 1988. Rising water levels in coastal Louisiana: Implications for two coastal forested wetland areas in Louisiana. Journal of Coastal Research, 4(4), 589-596. Charlottesville, (Virginia). ISSN 0749—208.

Couvillion, B.R.; H.Beck; D. Schoolmaster, and M. Fischer. 2017. Land area change in coastal Louisiana 1932 to 2016: U.S. Geological Survey Scientific Investigations Map 3381, 16p. pamphlet, httpsL//doi.org/10.3133/sim3381.

CPRA 2007. Louisiana's 2007 Comprehensive Master Plan for a Sustainable Coast.

CPRA 2017. Louisiana's 2017 Comprehensive Master Plan for a Sustainable Coast.

Flores and Eddleman, 1995. California black rail use of habitat in southwestern Arizona. Jour. Wildlife Man. Vol. 59, No.2. pp. 357-363.

Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority. 1998. Coast 2050: Toward a Sustainable Coastal Louisiana. 161 pp.

Robinson et al. 1995 Regional forest fragmentation and nesting success of migratory birds. Science. Vol. 267, Issue 5206. pp. 1987-90.

APPENDIX A

DIRECT CONSTRUCTION IMPACTS

Acres of direct wetland impacts are listed below by four regions (see Figures A1, A2, A3). The Sunset Drainage District region is divided by Louisiana Highway 306 into an eastern and western region.

Figure A1. West of Bayou Des Allemands region.

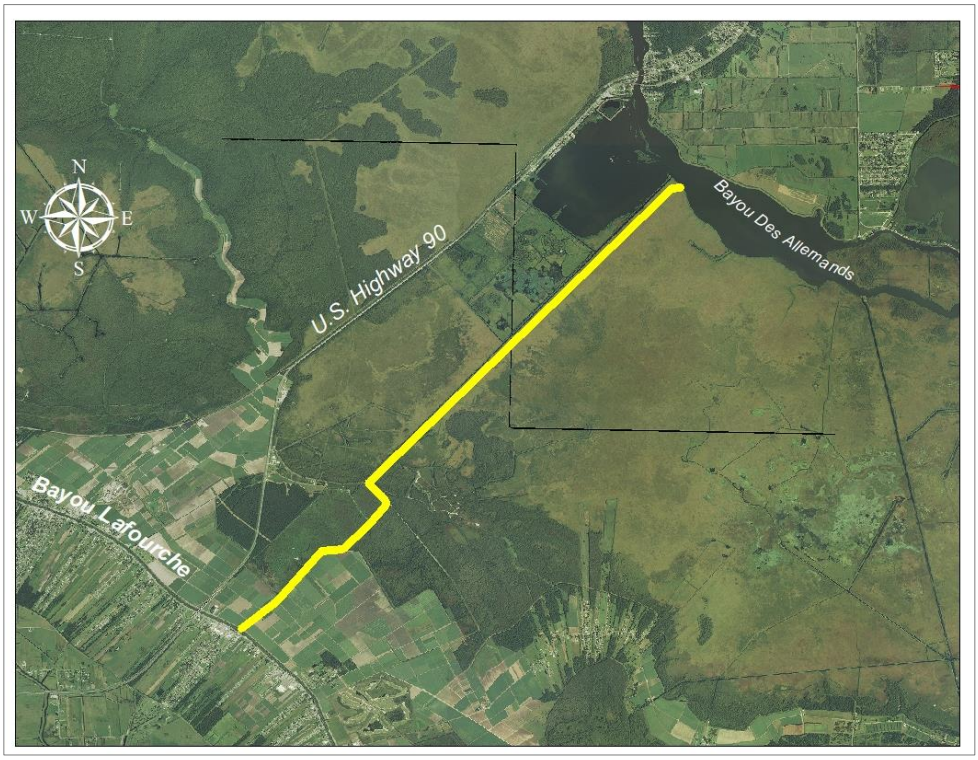


Figure A2. Map of the Sunset Drainage District region.

Figure A3. Map of the St. Charles Levee region.

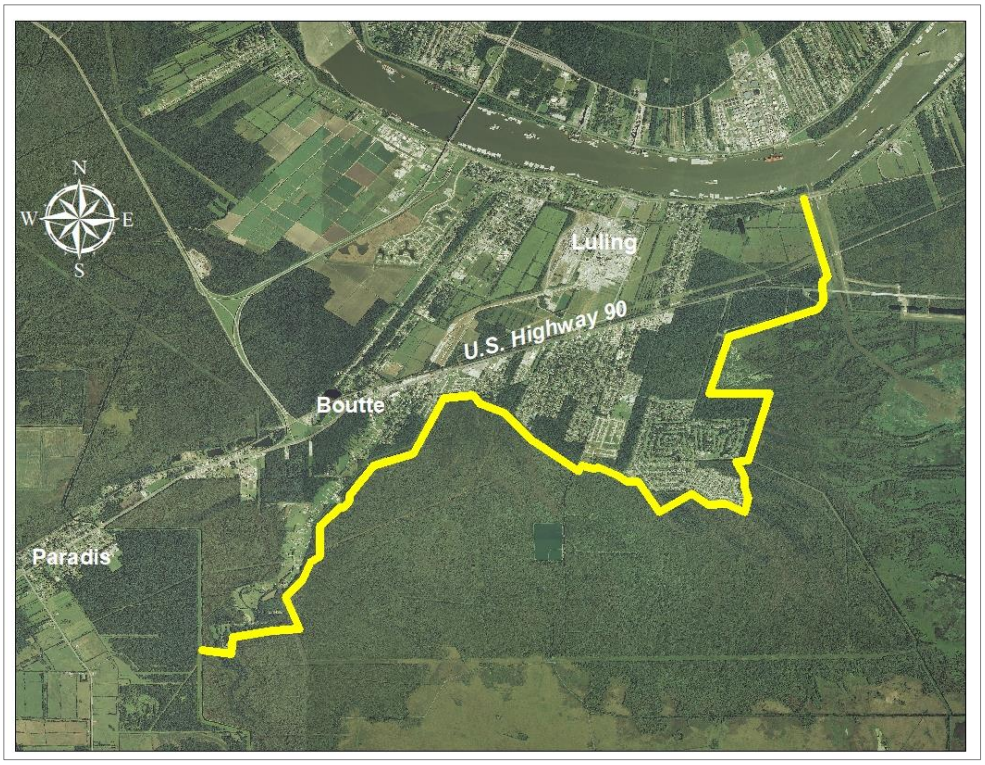


Table A-1. Acres of direct construction impacts by region, habitat type, and alternative.

BLH Impact & Location	Alt 1 (acres)	Alt 2 (acres)
West of Bayou Des Allemands		
Forested spoil banks	2.79	3.29
Dufrene Ponds access rd	6.32	6.32
Low quality BLH	10.60	11.09
Sunset Drainage District west of LA 306		
Med quality BLH	1.92	2.04
Low quality BLH	5.63	5.97
Sunset Drainage District east of LA 306		
High quality BLH	1.92	1.96
Med quality BLH	1.12	1.21
Low quality BLH	3.93	4.03
Abandoned field	7.10	7.43
Mitigation bank	0.35	0.37
St. Charles levee upgrade-lift		
Med quality BLH	na	6.94
Low quality BLH	na	36.00
TOTAL	**41.68**	**86.66**

Swamp Impact & Location	Alt 1 (acres)	Alt 2 (acres)
West of Bayou Des Allemands	0.00	0.00
Sunset Drainage District west of LA 306	0.00	0.00
Sunset Drainage District east of LA 306	1.04	1.08
St. Charles levee upgrade-lift	na	35.35
TOTAL	**1.04**	**36.43**

Fresh marsh Impact & Location	Alt 1 (acres)	Alt 2 (acres)
West of Bayou Des Allemands	136.5	143.6
Sunset Drainage District west of LA 306	0.00	0.00
Sunset Drainage District east of LA 306	0.00	0.00
St. Charles levee upgrade-lift	na	5.32
TOTAL	**136.54**	**148.93**

APPENDIX B

DIRECT CONSTRUCTION IMPACTS (AAHUs)

Table B-1. Direct construction impacts (AAHUs) by region, habitat type, and alternative.

	Alt 1		
BLH Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands			
Forested spoil banks	-0.79	-0.73	-0.41
Dufrene Ponds access rd	-0.50	-0.43	-0.30
Low quality BLH	-1.75	-1.66	-1.08
Sunset Drainage District west of LA 306			
Med quality BLH	-1.21	-1.21	-1.21
Low quality BLH	-2.32	-2.32	-2.32
Sunset Drainage District east of LA 306			
High quality BLH	-1.62	-1.62	-1.62
Med quality BLH	-0.92	-0.92	-0.92
Low quality BLH	-2.20	-2.20	-2.20
Abandoned field	-4.49	-4.49	-4.49
Mitigation bank	-0.25	-0.25	-0.25
St. Charles levee upgrade-lift			
Med quality BLH	na	na	na
Low quality BLH	na	na	na
TOTAL	**-16.05**	**-15.83**	**-14.80**

	Alt 2		
BLH Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands			
Forested spoil banks	-0.93	-0.86	-0.48
Dufrene Ponds access rd	-0.50	-0.43	-0.30
Low quality BLH	-1.82	-1.73	-1.13
Sunset Drainage District west of LA 306			
Med quality BLH	-1.28	-1.28	-1.28
Low quality BLH	-2.46	-2.46	-2.46
Sunset Drainage District east of LA 306			
High quality BLH	-1.65	-1.65	-1.65
Med quality BLH	-0.99	-0.99	-0.99
Low quality BLH	-2.26	-2.26	-2.26
Abandoned field	-4.70	-4.70	-4.7
Mitigation bank	-0.26	-0.26	-0.26
St. Charles levee upgrade-lift			
Med quality BLH	-2.03	-1.87	-1.09
Low quality BLH	-6.95	-6.28	-4.68
TOTAL	**-25.83**	**-24.77**	**-21.28**

	Alt 1		
Swamp Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands	0.0	0.0	0.0
Sunset Drainage District west of LA 306	0.00	0.00	0.00
Sunset Drainage District east of LA 306	-0.56	-0.56	-0.56
St. Charles levee upgrade-lift	na	na	na
TOTAL	**-0.56**	**-0.56**	**-0.56**

	Alt 2		
Swamp Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands	0.0	0.0	0.0
Sunset Drainage District west of LA 306	0.00	0.00	0.00
Sunset Drainage District east of LA 306	-0.58	-0.58	-0.58
St. Charles levee upgrade-lift	-23.55	-23.55	-21.47
TOTAL	**-24.13**	**-24.13**	**-22.05**

	Alt 1		
Fresh marsh Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands	-63.9	-69.6	-56.4
Sunset Drainage District west of LA 306	0.00	0.00	0.00
Sunset Drainage District east of LA 306	0.00	0.00	0.00
St. Charles levee upgrade-lift	na	na	na
TOTAL	**-63.92**	**-69.62**	**-56.35**

	Alt 2		
Fresh marsh Impact & Location	**Low SLR (AAHUs)**	**Int SLR (AAHUs)**	**High SLR (AAHUs)**
West of Bayou Des Allemands	-67.2	-73.2	-59.3
Sunset Drainage District west of LA 306	0.00	0.00	0.00
Sunset Drainage District east of LA 306	0.00	0.00	0.00
St. Charles levee upgrade-lift	-2.48	-2.70	-2.17
TOTAL	**-69.72**	**-75.94**	**-61.45**

APPENDIX C

BORROW SITE SELECTION CRITERIA

Where multiple alternative borrow areas exists, use of those alternative sites should be prioritized in the following order: existing commercial pits, upland sources, previously disturbed/manipulated wetlands within a levee system, and low-quality wetlands outside a levee system. The Service supports the use of such protocols to avoid and minimize impacts to wetlands and bottomland hardwoods within project areas. Avoidance and minimization of those impacts helps to provide consistency with restoration strategies and compliments the authorized hurricane protection efforts. Such consistency is also required by Section 303(d)(1) of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA).
Accordingly, the Service recommends that prior to utilizing borrow sites every effort should be made to reduce impacts by using sheetpile and/or floodwalls to increase levee heights wherever feasible. In addition, the Service recommends that the following protocol be adopted and utilized to identify borrow sources in descending order of priority:

1. Permitted commercial sources, authorized borrow sources for which environmental clearance and mitigation have been completed, or non-functional levees after newly constructed adjacent levees are providing equal protection.
2. Areas under forced drainage that are protected from flooding by levees, and that are:
    a) non-forested (e.g., pastures, fallow fields, abandoned orchards, former urban areas) and non-wetlands;
    b) wetland forests dominated by exotic tree species (i.e., Chinese tallow-trees) or non-forested wetlands (e.g., wet pastures), excluding marshes;
    c) disturbed wetlands (e.g., hydrologically altered, artificially impounded).
3. Sites that are outside a forced drainage system and levees, and that are:
    a) non-forested (e.g., pastures fallow fields, abandoned orchards, former urban areas) and non-wetlands;
    b) wetland forests dominated by exotic tree species (i.e., Chinese tallow-trees) or non-forested wetlands (e.g., wet pastures), excluding marshes;
    c) disturbed wetlands (e.g., hydrologically altered, artificially impounded).

Notwithstanding this protocol, the location, size and configuration of borrow sites within the landscape is also critically important. Coastal ridges, natural levee flanks and other geographic features that provide forested/wetland habitats and/or potential barriers to hurricane surges should not be utilized as borrow sources, especially where such uses would diminish the natural functions and values of those landscape features.

To assist in expediting the identification of borrow sites, the Service recommends that immediately after the initial identification of a new borrow site the Corps should initiate informal consultation with the Service regarding potential impacts to federally listed threatened or endangered species. To aid you in complying with those proactive consultation responsibilities, the Service has provided (in the above letter) a list of threatened and endangered species and their critical habitats within the project area.

APPENDIX D

MITIGATION SUCCESS CRITERIA AND MITIGATION MONITORING: MARSH MITIGATION FEATURES (Fresh, Intermediate, and Brackish Marsh Habitats)

MITIGATION SUCCESS CRITERIA

The success (performance) criteria described herein are applicable to all proposed marsh habitats (fresh marsh, intermediate marsh, and brackish marsh restoration features), unless otherwise indicated.

1. General Construction

A. Complete all initial mitigation construction activities (e.g. construction of temporary retention/perimeter dikes, placement of fill (borrow material/dredged material), construction of permanent dikes if applicable, etc.) in accordance with the mitigation work plan and final project plans and specifications. Upon completion of construction, USACE or its contractor shall provide construction surveys to include all project features. These activities are classified as "initial construction requirements."

B. Approximately 1 year following completion of all initial mitigation construction activities (when the restored marsh feature has stabilized to the point that the containment berms are no longer required to prevent the loss of fill material from the project site), USACE or its contractor shall complete all final mitigation construction activities, in accordance with the mitigation work plan and final project plans and specifications. Such activities may include, but are not limited to: degrading temporary retention/perimeter dikes; completion of armoring of permanent dikes; "gapping" or installation of "fish dips"; soil testing; completion of plantings; and construction of trenasses or similar features within marsh features as a means of establishing shallow water interspersion areas within the marsh. Finishing the aforementioned construction activities will be considered as the "completion of final construction requirements".

2. Topography[1]

A. Initial Success Criteria:
   1. One year after completion of fill placement:
      - Demonstrate that at least 80% of each mitigation feature has a surface elevation that is within +0.5 to – 0.5 feet of the desired target surface elevation as determined by the settlement curve for that year.
   2. Two years after completion of fill placement:
      - Demonstrate that at least 80% of the mitigation site has a surface elevation that is within +0.5 feet to – 0.25 of the desired target surface elevation as determined by the settlement curve for that year.

B. Intermediate Success Criteria:
   1. Two years following achievement of Topography Criteria 2.A.2. —

- Demonstrate that at least 80% of the mitigation site has a surface elevation that is within the functional marsh elevation range[2].
- There are no additional monitoring or attainment requirements for topography beyond meeting the Intermediate Success Criteria for topography.

Notes:
[1]Elevation survey data and report will be provided to the IET for review in order to determine concurrence. The surveys must include water levels inside and outside the marsh creation site at locations representative of site conditions.
[2]The "functional marsh elevation range", i.e. the range of the marsh surface elevation that is considered adequate to achieve proper marsh functions and values, is determined during the final design phase.

3. Native Vegetation

A. Fresh marsh:

1. Initial Success Criteria (2 growing seasons following completion of initial construction activities in General Construction 1.A.):
   - Achieve a minimum average cover of 50% comprised of native herbaceous species.
   - Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria.
2. Intermediate Criteria (2 years following attainment of Native Vegetation Criteria 3.A.1.):
   - Achieve a minimum average cover of 60% comprised of native herbaceous species.
   - Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria.
3. Long-Term Success Criteria[3] (Every monitoring event after attainment of Native Vegetation Criteria 3.A.2.):
   - Achieve a minimum average cover of 60% comprised of native herbaceous species.
   - Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria.

Notes:
[1]Fresh marsh is typically not planted due to the expectation that it will naturally vegetate more quickly than intermediate or brackish marsh. However, if percent cover success criteria are not met, plantings may become necessary in the absence of other recommended actions

B. Intermediate marsh and brackish marsh:

1. Initial Success Criteria (2 growing seasons following completion of initial construction activities in General Construction 1.A.):
   - Initial plantings must attain at least 80% survival of planted species, or achieve a minimum average cover of 25% native herbaceous species (includes planted species and volunteer species). If site self-vegetates, the site must achieve a minimum average cover of at least 50% native herbaceous species.
   - Demonstrate that vegetation satisfies USACE hydrophytic vegetation criteria.
2. Intermediate Criteria (2 years following attainment of Native Vegetation Criteria 3.B.1):
   - Achieve a minimum average cover of 60%, comprised of native herbaceous species (includes planted species and volunteer species).

- Demonstrate that native vegetation satisfies USACE hydrophytic vegetation criteria.

3. Long-Term Success Criteria[3] (Every monitoring event after attainment of Native Vegetation Criteria 3.B.2.):
   - Achieve a minimum average cover of 60%, comprised of native herbaceous species (includes planted species and volunteer species).
   - Demonstrate that native vegetation satisfies USACE hydrophytic vegetation criteria.

Note:
[1]There is not a minimum average cover requirement for years 21 – 50. However, vegetation data will be collected throughout the 50-year project life.

4. Invasive and Nuisance Vegetation (for all marsh types)

A. Initial, Intermediate, and Long-term[1] Success Criteria
   - Maintain the project area such that the total average vegetative cover accounted for by invasive and nuisance species constitute less than 5% of the total average plant cover throughout the 50-year project life. The list of invasive and nuisance species is found in Appendix A and will be tailored to reflect specific site needs.

Note:
[1]Yearly inspections to determine the need for invasive/nuisance control would be conducted until the long term success criteria for vegetation is achieved. After it is achieved, the frequency of inspections to determine the need for invasive/nuisance control would be adjusted based on site conditions.

MITIGATION MONITORING GUIDELINES

The guidelines for mitigation monitoring provided herein are applicable to all types of marshes being restored unless otherwise indicated.

Baseline Monitoring Report (First Monitoring Report)

A "baseline" monitoring report will be prepared upon completion of Final Construction Requirements 1.B. and upon any re-plantings associated with construction. Information provided will typically include the following:

- A detailed discussion of all mitigation activities completed.

- A plan view drawing of the mitigation site showing the approximate boundaries of the restored marsh, significant interspersion features established within the marsh features (as applicable), proposed monitoring transect locations, proposed sampling plot locations, photo station locations and water level survey locations.

- Initial and final construction surveys of all project features (including but not limited to the fill area, fish dips, weirs, culverts, etc.) and an analysis of the survey data will be provided addressing attainment of topographic success criteria. If a project is immediately adjacent to

existing marsh habitat, the topographic survey will include spot elevations collected within the existing marsh habitat near the restored marsh.

- Photographs documenting conditions in the project area will be taken at the time of monitoring. Photos will be taken at permanent photo stations within the restored marsh. At least two photos will be taken at each station with the view of each photo always oriented in the same general direction from one monitoring event to the next. The number of photo stations required and the locations of these stations will vary depending on the mitigation site. The USACE will make this determination in coordination with the Interagency Team and will specify the requirements in the Mitigation Monitoring Plan. At a minimum, 4 photo stations will be established within each marsh cell.

- For planted marsh only -- A detailed inventory of all species planted, including the number of each species planted, the stock size planted, and where the species were planted will be documented. For mitigation sites that include more than one planted marsh cell/feature, provide a breakdown itemization indicating the number of each species planted in each feature and correlate this itemization to the marsh features depicted on the plan view drawing of the mitigation site.

- As part of the as-built/final construction survey, water level surveys will be taken inside and outside the marsh creation site at predetermined locations identified in coordination with the IET and NFS. Each interior water level elevation should have a corresponding exterior water level elevation taken consecutively and within close proximity. If there appears to be disparity in water levels within the marsh creation site, additional shots may be required. The baseline monitoring report will provide the surveyed water level data and will compare it to mean high and mean low water elevation data collected from a tidal elevation recording station in the general vicinity of the mitigation site. The report will further address estimated mean high and mean low water elevations at the mitigation site based on field indicators.

- Various qualitative observations will be made in the mitigation site to help assess the status and success of mitigation and maintenance activities. These observations will include: general estimate of the average percent cover by native plant species; general estimates of the average percent cover by invasive and nuisance plant species; general observations concerning colonization of the mitigation site by volunteer native plant species; general condition of native vegetation; trends in the composition of the plant community; wildlife utilization as observed during monitoring (including fish species and other aquatic organisms); the condition of interspersion features (tidal channels, trenasses, depressions, etc.) constructed within the marsh features, noting any excessive scouring and/or siltation occurring within such features; the natural formation of interspersion features within restored marshes; observations regarding general surface water flow characteristics within marsh interspersion features; the general condition of “gaps”, “fish dips”, or similar features constructed in permanent dikes; if present, the general condition of any armoring installed on permanent dikes. General observations made during the course of monitoring will also address potential problem zones and other factors deemed pertinent to the success of the mitigation project.

- A summary assessment of all data and observations along with recommendations as to actions necessary to help meet mitigation and management/maintenance goals and mitigation success criteria.

- A brief description of anticipated maintenance/management work to be conducted during the period from the current monitoring report to the next monitoring report.

Additional Monitoring Reports

All monitoring reports generated after the Baseline Monitoring Report will be called either Initial, Intermediate or Long-Term Monitoring Reports and shall include the year in which the monitoring occurred (i.e. Monitoring Report 2019). All Monitoring Reports shall provide the following information unless otherwise noted:

- All items listed for the Baseline Monitoring Report with the exception of: (a) the topographic surveys, although additional topographic surveys are required for specific monitoring reports (see below); and (b) the inventory of species and location map for all planted species.

- Quantitative data for all plants in each stratum. Data will be collected from permanent sampling quadrats established at approximately equal intervals along permanent monitoring transects established within each marsh feature. Each sampling quadrat will be approximately 2 meters X 2 meters in size (although the dimensions of each quadrat may be increased, if necessary, to provide better data in planted marsh features). The number of monitoring transects and number of sampling quadrats per transect will vary depending on size of the mitigation site and will be determined by the IET during the final design phase of the project. The resulting requirements, including quadrat dimensions, will be specified in the Final Mitigation Monitoring Plan for the project. Data recorded from the sampling quadrats will include but not be limited to: average total percent cover by native plant species; average total percent cover by invasive plant species; average total percent cover by nuisance plant species; percent cover of each plant species; the wetland indicator status of each species; and the average percent survival of each planted species (i.e. number of living planted species as a percentage of total number of plants installed), if discernable at the time of monitoring.

- One photograph shall be taken from the SE corner of each sampling plot to clearly capture the vegetation plot and must include a sign that indicates the plot number and sampling date.

- A brief description of maintenance and/or management work performed since the previous monitoring report along with a discussion of any other significant occurrences.

- Topographic surveys of each marsh restoration feature for initial and intermediate monitoring events (at approximately 2 years and 4 years following completion of final construction activities (General Construction 1.B.)). These surveys will cover the same components as described for the topographic survey conducted for the Baseline Monitoring Report. In addition to the surveys themselves, each of the two monitoring reports will

include an analysis of the topographic data in regards to the attainment of applicable topographic success criteria. If the surveys indicate topographic success criteria have not been achieved and supplemental topographic alterations are necessary, then another topographic survey will be required following completion of the supplemental alterations. This determination will be made by USACE and the IET.

Monitoring Reports Following Planting or Re-planting Activities

Planting or re-planting of certain areas within restored marsh habitats may be necessary to ensure attainment of applicable native vegetation success criteria. Any monitoring report submitted following completion of a planting event must include an inventory of the number of each species planted, the stock size used, and the locations for each species planted. It must also include a depiction of the areas re-planted or those planted, as applicable, cross-referenced to a listing of the species and number of each species planted in each area. The perimeter of re-planted area should be documented with GPS coordinates. If single rows are replanted, then GPS coordinates should be taken at the end of the transect.

MITIGATION MONITORING SCHEDULE AND RESPONSIBILITIES

Monitoring will typically take place in mid to late summer during the required years for monitoring, but may be delayed until later in the growing season due to site conditions or other unforeseen circumstances. Monitoring Reports will be submitted by December 31 of each year of monitoring to the USACE, NFS, and the IET. The various monitoring and reporting responsibilities addressed in this section are all subject to the provisions set forth in the Introduction section.

The USACE will be responsible for conducting the monitoring events and preparing the associated monitoring reports until such time that the following mitigation success criteria are achieved (criteria follow numbering system used in success criteria section):

1. General Construction – 1.A. and 1.B.
2. Topography – 2.A.1 and 2.A.2.
3. Native Vegetation – For fresh marsh features, criteria 3.A.1; for intermediate marsh and brackish marsh features, criteria 3.B.1.
4. Invasive & Nuisance Vegetation – 4.A. until such time as monitoring responsibilities are transferred to the NFS.

The USACE will be responsible for conducting Baseline and Initial Success Monitoring events and preparing the associated monitoring reports.

The NFS will be responsible for conducting the required monitoring events and preparing the associated monitoring reports for all other required years after the USACE has achieved the initial success criteria listed above. The responsibility for management, maintenance, and monitoring of the non-structural components of the mitigation project (i.e. vegetation) will typically be transferred to the NFS during the first quarter of the year immediately following submittal of the monitoring report that demonstrates attainment of the initial success criteria. Once monitoring responsibilities have been transferred to the NFS, the next monitoring event

(Intermediate) should take place 2 growing seasons after Initial Success (Topography 2.A.2 and Native Vegetation 3.A.1 or 3.B.1) has been met. After Intermediate Success Criteria (Topography 2B and Native Vegetation 3.A.2 or 3.B.2) has been met, Long-Term Success Criteria monitoring will be conducted every 5 years throughout the remaining 50-year period of analysis (which begins once initial success criteria have been met).

In certain cases, it is possible that the marsh mitigation features may be established along with other mitigation features, like swamp or bottomland hardwood habitats, at the same mitigation site. This scenario could require some adjustments to the typical monitoring schedule described above in order to develop a reasonable and efficient monitoring schedule that covers all the mitigation features. Such adjustments, if necessary, would be made at the time final mitigation plans are generated. This schedule must be in general accordance with the guidance provided above and will be prepared by the USACE and the IET.

If certain success criteria are not achieved, failure to attain these criteria would trigger the need for additional monitoring events not addressed in the preceding paragraphs. The USACE would be responsible for conducting such additional monitoring and preparing the associated monitoring reports in the following instances:

(A) For fresh marsh features –

- If the initial vegetative cover success criteria (3.A.1) are not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable vegetative cover criteria have been satisfied. This requirement only exists if planting the marsh mitigation feature is required to meet the success criteria, the USACE would be responsible for the purchase and installation of the required plants.

(B) For intermediate and brackish marsh features –

- If the initial survival criteria for planted species or the initial vegetative cover criterion (3.B.1) are not achieved a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable survival criteria or vegetative cover criteria have been satisfied. The USACE would be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(C) For all types of marsh features–

- If initial topographic success criteria (2.A.1 and 2.A.2) are not achieved, the IET would convene to determine whether corrective actions are necessary. If corrective actions are necessary additional surveys and a monitoring report will be required to indicate whether applicable criteria have been satisfied. The USACE would also be responsible for performing the necessary corrective actions.

- If initial invasive and nuisance species criteria (4.A) are not achieved a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable criteria have been satisfied. The USACE would be responsible for the irradiation activities needed to attain the success criteria.

There could also be cases where failure to attain certain success criteria would trigger the need

for additional monitoring events for which the NFS would be responsible:

(A) For fresh marsh features –

- If the native vegetation intermediate success criteria (3.A.2) are not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the success criteria have been satisfied. The Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(B) For intermediate and brackish marsh features –

- If the native vegetation intermediate success criteria (3.B.2) are not achieved, a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the native vegetation intermediate success criteria has been satisfied. The Sponsor would also be responsible for the purchase and installation of supplemental plants needed to attain the success criteria.

(C) For all types of marsh features –

- If the topographic intermediate success criteria (2.B.) are not achieved, the IET would convene to determine whether corrective actions are necessary. If corrective actions are necessary, additional surveys and a monitoring report will be required to indicate whether applicable criteria have been satisfied. The NFS would also be responsible for performing the necessary corrective actions if the IET determines such corrective actions are necessary.

- If the native vegetation long term success criteria (3.A.3 and 3.B.3) are not achieved, the IET would convene to discuss whether corrective actions would be necessary. If corrective actions are necessary, a monitoring report will be required for each consecutive year following completion of the corrective actions until two sequential annual reports indicate that the native vegetative cover criteria have been attained. The NFS would be responsible for performing the corrective actions, conducting the additional monitoring events, and preparing the associated monitoring reports.

- If the intermediate and long term invasive and nuisance species criteria (4.A) are not achieved a monitoring report will be required for each consecutive year until two sequential annual reports indicate that the applicable criteria have been satisfied. The NFS would be responsible for the irradiation activities needed to attain the success criteria.

Once monitoring responsibilities have been transferred to the NFS, the NFS will retain the ability to modify the monitoring plan and the monitoring schedule should this become necessary due to unforeseen events or to improve the information provided through monitoring. Fifteen years following achievement of Long Term Success Criteria, the number of monitoring transects and/or quadrats that must be sampled during monitoring events may be reduced substantially if it is clear that mitigation success is proceeding as anticipated. Any significant modifications to the monitoring plan or the monitoring schedule must first be approved by the USACE and the IET.

APPENDIX E

TWELVE REQUIRMENTS FOR MITIGATION PLANNING
(from the U.S. Army Corps of Engineers & EPA 2008 Final Mitigation Rule in the FEDERAL REGISTER Vol. 73, No. 70, April 10, 2008)

Twelve Requirements for a Compensatory Mitigation Plan

1. Objectives. A description of the resource type(s) and amount(s) that will be provided, the method of compensation (restoration, establishment, preservation etc.), and how the anticipated functions of the mitigation project will address watershed needs.

2. Site selection. A description of the factors considered during the site selection process. This should include consideration of watershed needs, onsite alternatives where applicable, and practicability of accomplishing ecologically self-sustaining aquatic resource restoration, establishment, enhancement, and/or preservation at the mitigation project site.

3. Site protection instrument. A description of the legal arrangements and instrument including site ownership, that will be used to ensure the long-term protection of the mitigation project site.

4. Baseline information. A description of the ecological characteristics of the proposed mitigation project site, in the case of an application for a DA permit, the impact site. This may include descriptions of historic and existing plant communities, historic and existing hydrology, soil conditions, a map showing the locations of the impact and mitigation site(s) or the geographic coordinates for those site(s), and other characteristics appropriate to the type of resource proposed as compensation. The baseline information should include a delineation of waters of the United States on the proposed mitigation project site. A prospective permittee planning to secure credits from an approved mitigation bank or in-lieu fee program only needs to provide baseline information about the impact site.

5. Determination of credits. A description of the number of credits to be provided including a brief explanation of the rationale for this determination.
    - For permittee-responsible mitigation, this should include an explanation of how the mitigation project will provide the required compensation for unavoidable impacts to aquatic resources resulting from the permitted activity.
    - For permittees intending to secure credits from an approved mitigation bank or in-lieu fee program, it should include the number and resource type of credits to be secured and how these

were determined.

6. Mitigation work plan. Detailed written specifications and work descriptions for the mitigation project, including: the geographic boundaries of the project; construction methods, timing, and sequence; source(s) of water; methods for establishing the desired plant community; plans to control invasive plant species; proposed grading plan; soil management; and erosion control measures. For stream mitigation projects, the mitigation work plan may also include other relevant information, such as planform geometry, channel form (e.g., typical channel cross-sections), watershed size, design discharge, and riparian area plantings.

7. Maintenance plan. A description and schedule of maintenance requirements to ensure the continued viability of the resource once initial construction is completed.

8. Performance standards. Ecologically-based standards that will be used to determine whether the mitigation project is achieving its objectives.

9. Monitoring requirements. A description of parameters monitored to determine whether the mitigation project is on track to meet performance standards and if adaptive management is needed. A schedule for monitoring and reporting monitoring results to the DE must be included.

10. Long-term management plan. A description of how the mitigation project will be managed after performance standards have been achieved to ensure the long-term sustainability of the resource, including long-term financing mechanisms and the party responsible for long-term management.

11. Adaptive management plan. A management strategy to address unforeseen changes in site conditions or other components of the mitigation project, including the party or parties responsible for implementing adaptive management measures.

12. Financial assurances. The DE may require additional information as necessary to determine the appropriateness, feasibility, and practicability of the mitigation project.

Other information. The DE may require additional information as necessary to determine the appropriateness, feasibility, and practicability of the mitigation project.